TRANSACTIONS

OF THE

TWENTY-SEVENTH ANNUAL MEETING

OF THE

AMERICAN LARYNGOLOGICAL, RHINOLOGICAL AND OTOLOGICAL SOCIETY, INC.

HELD IN

ATLANTIC CITY, N. J.

370745
28.8.39

June 3rd and 4th, 1921

NEW YORK:
PUBLISHED BY THE SOCIETY
1921

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TRANSACTIONS

OF THE

TWENTY-SEVENTH ANNUAL MEETING

OF THE

AMERICAN LARYNGOLOGICAL, RHINOLOGICAL AND OTOLOGICAL SOCIETY, INC.

Held in Atlantic City, June 3rd and 4th.

PRESIDENT'S ADDRESS.

STUDIES IN OTOLOGY USING THE PITCH RANGE AUDIOMETER.

By L. W. DEAN, M. D., Iowa City, Ia.

Fellows of the American Laryngological, Rhinological and Otological Society. Gentlemen: Before opening the scientific session of this Society I desire to thank you for the very great honor you have conferred upon me.

In preparing my address for this occasion it seemed best to me to talk about those things in which I have been particularly interested. My colleague, Mr. C. C. Bunch, has devised some excellent methods for the measurement of a part of the tonal range. These procedures have been used for the study and investigation of the cases in our otological service. While the results of these observations have not been revolutionary or of great practical benefit to otology they have been of much scientific interest to us.

While the pitch range audiometer has been proven to be an important diagnostic aid in otology, its greatest use so far has been to study the variations of the tonal range within the limits of the machine. The clinical charts of our cases have been made more complete and exact by its use. The variations in the tonal range from 30 d. v. to 7070 d. v. are graphically illustrated and

by repeated examinations as the disease progresses or improves the retrogression or improvement has been demonstrated.

During the last year our plan has been to select a number of cases of a certain otological condition. Each case was conscientiously examined and the results compared. When it seemed desirable defects in the tonal ranges indicated by the audiometer were confirmed with the tuning forks. The examinations were made by Mr. Bunch or under his supervision. The usual otological examination including the functional examination of the cochlear apparatus was carried out in every case. When indicated the function of the vestibular mechanism was also determined.

This gave us for each diseased condition selected a number of charts representing the tonal range as determined by the audiometer. In each instance the charts made by examination of individuals with the same disease were strikingly similar. Also noteworthy was the similarity of the curves when a given structure was involved by different pathological processes. For example the curves showing involvement of the cochlea in syphilis, splenic leukemia, from traumatism, otosclerosis, or when secondary to middle ear disease are similar.

Later in the session Mr. Bunch will demonstrate his apparatus for measuring the total range, so no description of it will be given at this time.

We should, however, get a clear conception of just what the normal curve on the chart represents.

Plate I shows two curves of normal hearing for the two different types of audiometers. The second curve is for the one installed in September and has been in continual service since.

The figures at the bottom of the chart indicate the range of frequencies that are produced. The numbers at the left indicate the intensities, faint tones being produced on step I and the louder ones toward the bottom of the chart. For convenience we have indicated the curve for the right ear by a line of dashes and that for the left by dotted lines.

The curves are only tentative. The two normal curves are different because the two machines are different in construction. Just as in perimetry of the eye, the perimetric figure is compared to the normal visual field, so here the curve of the patient examined is compared to the normal curve and defects noted.

To secure the curve for the patient a mark is made on the chart showing at just what intensity each note from 30 d. v. to 7070 d. v. is heard. These marks when joined constitute the curve

representing the hearing of the patient examined. The curve thus secured when compared with the normal curve for the machine represents graphically the defects in the tonal range of the audiometer if any are present.

Mr. Bunch determined the normal curve in the following manner: a group of students in advanced psychology and the adolescents and young adults in our service who were known to have clinically normal hearing were tested. As the result of the tests, some twenty-five in number, our working normal was determined. From the charts which follow it will be seen that this curve was often surpassed in different portions of the range, but this in no way detracted from its value as a comparative standard.

Plate II. Curve of right ear before and after the removal of impacted wax from its external auditory canal.

PLATE I

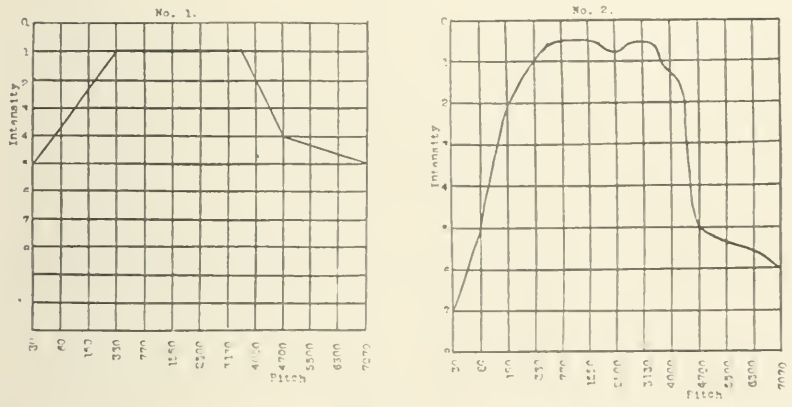


Plate I.

NORMAL CURVES.

No. 1. Normal of Audiometer used up to Sept. 1920.
No. 2. Normal with new Audiometer.

Note that while there is an interference with the audition of all notes within the range of the audiometer the diminution is more marked in the upper part of its range from about 4000 d. v. to 7070 d. v. Note the sudden descent in the curve from 4000 d. v. to 4700 d. v. indicative of the diminution of audition for notes in this part of the range. C^5 fork (4096 d. v.) is not heard by A. C. The audition of the notes from 7070 d. v. to the upper tone limit by A. C. is much diminished. The upper limit by A. C. as measured by the monochord is much lowered, while by B. C. it is normal.

After the removal of the wax the C^5 fork is heard at the normal distance and the upper limit by A. C. is normal. After the removal of the wax the audiometer curve (the upper one in the chart) approaches the normal.

Plate III shows curves secured in two cases before and after packing the external auditory canal with boric acid powder. The curves with the dashes are the audiometer curves secured before the introduction of the boric acid powder; the ones with the dots are made after its introduction.

The same interference with audition for notes in the upper part of the range of the audiometer was noted as in the case of impacted wax. The upper limit of the tonal range as detected with the monochord by A. C. was lowered by the introduction of the powder into the canal while the upper limit by B. C. was not changed.

PLATE II.

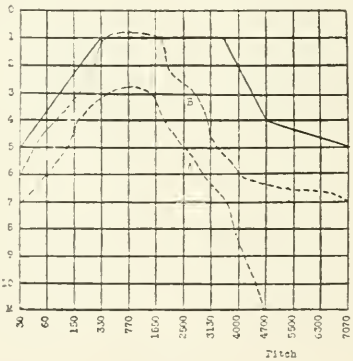


Plate II.

L. W. D.

Curves before and after the removal of impacted wax from external canal, right.
A. Curve before removal of wax.
B. Curve after removal of wax.
Voice. Before Wh. 5 ft. Sp. 15 ft. After Wh. 15 ft. Sp. 45 ft.
Upper limit. Before removal Monochord, A. C. much diminished.
B. C. Normal.
„5 (4096 d. v.) fork not heard by A. C.

Plate IV shows the curves of a soldier recently returned from France. His only complaint was continuous distressing tinnitis in the left ear. Hearing right and left S. V. 45 ft. W. 15 ft. A little bit of cotton was found in the left ear. It was removed with the disappearance of the tinnitis. Note that the curve No. 1 for the left ear shows normal audition for notes from 500 d. v. to 1500 d. v., the range of the human voice, while we have

the same diminution in audition for notes in the upper part of the audiometer range as in the cases of impacted wax and boric

PLATE III.

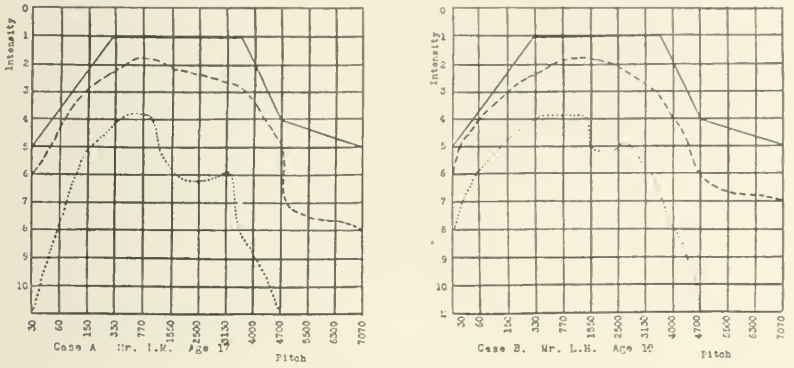


Plate III.

Case A. Mr. I. M. Age 17. Case B. Mr. L. H. Age 18.
Showing effect of packing external auditory canal with boric acid powder.
————Curve before packing canal with boric powder.
.....Curve after packing with boric powder.
Note that Case A shows the same interference with tones above 4000 d. v. as is shown in the case of impacted wax.

Upper Limit. Monochord	A.	B.
Before packing	A. C. 19000 B. C. 20000	A. C. 19000 B. C. 20000
With external canals closed	A. C. 17000 B. C. 20000	A. C. 17000 B. C. 20000

acid powder in the external auditory canal. With the removal of the cotton the curve for the left ear became practically normal.

PLATE IV

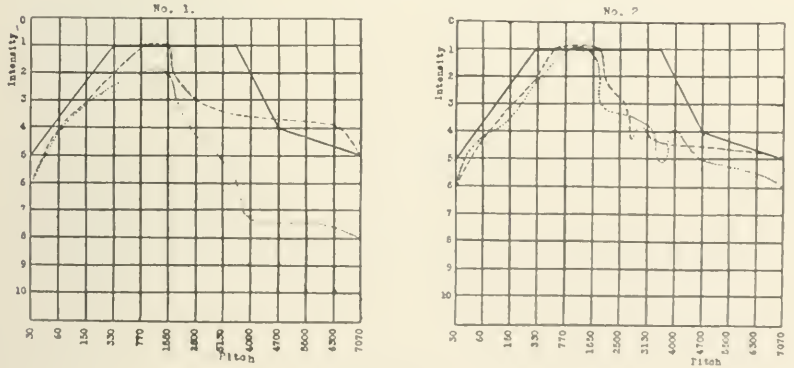


Plate IV.

Mr R. D. Age 29.

No. 1. Cotton in Left Ear.
No. 2. After removal of cotton, Left.
Diagnosis: Plug of cotton in Left External Canal.
Voice: (Before Removal) Normal. Showing range of voice from about 500 d. v. to 1500 d. v. practically normal in curve No. 1.

We have found some difficulty in securing curves of middle ear disease without involvement of the inner ear. Our observations would tend to confirm Emerson's statement regarding the frequency of cochlear involvement in middle ear disease. The following three curves represent the condition in three cases that were in our judgment cases of pure middle ear diseases.

I trust that no observation that I report today will be considered definite. I am reporting this work hoping it will be of interest to you and that perhaps some of these things will be worthy of your further consideration. Our work on the middle ear diseases has been particularly unsatisfactory. It is our plan to devote much of our time during the coming year to this subject. Mr. Bunch hopes to have a machine that will test all tones from 7000 d. v. to the upper limit. Such a machine should give some interesting information regarding the early involvement of the cochlea in middle ear disease.

PLATE V.

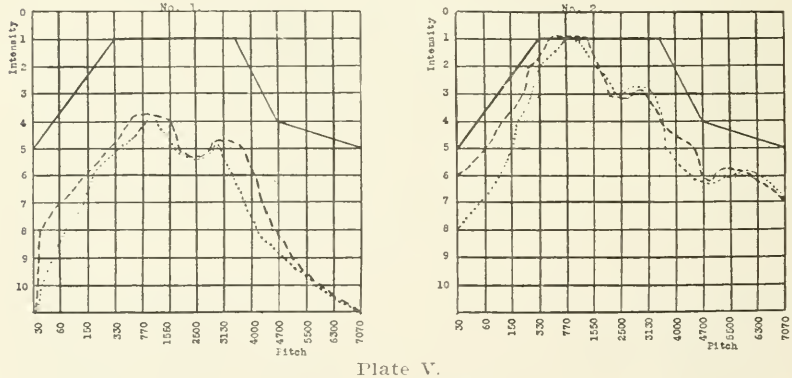


Plate V.

Mr. C. C. Age 15.

Diagnosis: Acute Tubal Catarrh.
Voice: Curve 1 R Wh. 9 ft. Sp. 16 ft.
L Wh. 6 ft. Sp. 15 ft.
Curve 2 (After Inflation.)
R Wh. 15 ft. Sp. 45 ft.
L Wh. 15 ft. Sp. 45 ft.

In the cases which are shown the curves were not used for diagnostic purposes. The clinical diagnosis was made and then the curve of the case secured.

Plate V shows curves of acute tubal catarrh before and after inflation of the middle ear. The first curve shows a uniform diminution in the audition of all notes within the range of the audiometer except the very low notes. The audition for these is much more diminished, 30 d. v. not being heard at the greatest intensity in either ear.

After inflation the hearing for whisper and spoken voice which had been diminished became normal and the audiometer curves closely approach the normal. Naturally if any diminution of hearing within the range of the audiometer was due to cochlear involvement it would not be improved by inflation. We consider the decreased audition for the higher notes within the range of the audiometer in this case to be due to the middle ear lesion.

Plate VI. The right Eustachian tube was blocked by an adenoma in Rosenmüeller's fossa. The right tympanic membrane was much retracted. Note the rather uniform diminution in audition for the notes within the range of the audiometer. The upper limit by B. C. with the monochord was 18,000, practically normal.

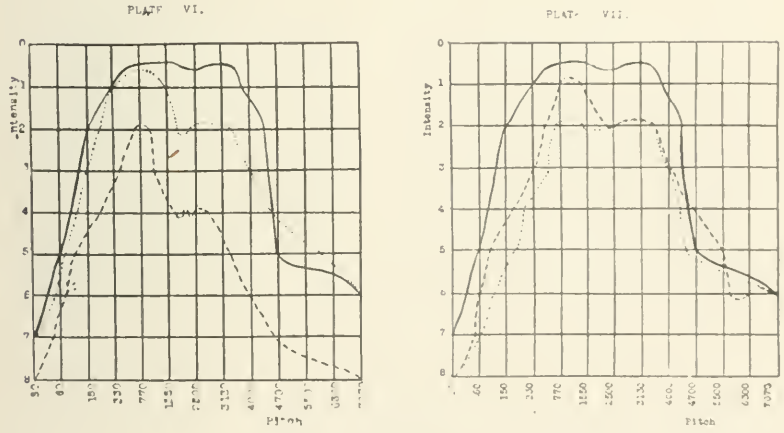


Plate VI.

Mr. R. H. Age 18.

Diagnosis: Adenoma of the Fossa of Rosenmüller, Right, blocking Eustachian Tube.
Drum Membrane, Right, much retracted
Voice: R. Wh. 12 ft. Sp. 30 ft.
L Wh. 15 ft. Sp. 45 ft.
Galton Whistle: R 19000 L 23000.
Koenig Cylinders: R 19000 L 21000.
Monochord: R A. C. 17000 B. C. 18000
L A. C. 19000 B. C 21000

Plate VII.

Miss C. H. Age 18.

Diagnosis: Chronic Hyperplastic Otitis Media, Mild Type
Voice: R Wh. 15 ft. Sp. 45 ft.
L Wh. 15 ft. Sp. 15 ft.
Galton Whistle R 22000 L 22000
Koenig Cylinders R 40960 L 10960
Monochord: R A. C. 19000 B. C. 25000
L A. C. 20000 B. C. 20000
Note that audition for tones above 400 d. v. is normal

Plate VII. This shows the curves of a mild case of chronic hyperplastic otitis media in each ear. Note that audition for notes in the lower one-half of the range of the audiometer, i. e., from 30 d. v. to 4000 d. v. is uniformly diminished while that from 4000 to 7070 is normal, quite different from the curve of the case of cotton in the external auditory canal. In each case the hearing by voice and whisper tests was the same.

Plate VIII illustrates the curves for the right and left ears in a case of marked chronic hyperplastic otitis media with cochlear degeneration. With the audiometer notes are heard only from 100 d. v. to 800 d. v., B. C. decreased ten seconds in each

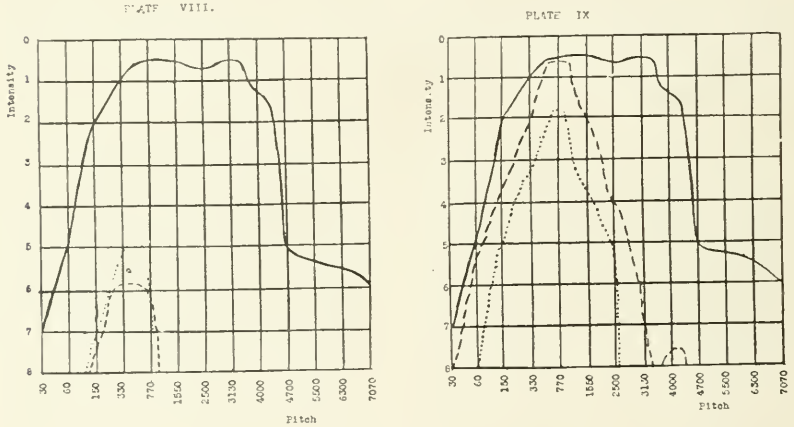


Plate VIII.

Mrs. W. Age 30.

Diagnosis: Chronic Hyperlastic Otitis Media with Involvement of the cochlea following discharging ears at age of three years.
Voice: Each, only loud voice, no words.
B. C. c R-3 sec. (?) L-4 sec. (?)
c^2 decreased 10 sec. in both.
Monochord not heard by B. C.
A. C. No high tones heard.
Whistles (loud) heard to a^2.

Forks	50d. v.	c	c^1	c^2	c^3	c^4	c^5
R	0	0	1/14	4/18	0	0	0
L	1/2	1/10	2/14	8/18	0	0	0

Plate IX.

Mr. H. A. Age 47.

Diagnosis: Blocking of each Eustachian Tube by an Ulcerating Malignant Growth in the Naso-Pharynx resulting in an acute serous catarrh of the middle ear.
Voice: R Wh. 15 ft. Sp. 45 ft.
L Wh. 2 ft. Sp. 6 ft.

Forks	50 d. v.	c	c^1	c^2	c^3	c^4	c^5
R	2/4	4/8	8/12	12/18	20/24	24/48	1/120
L	1/8	1/8	2/12	3/18	6/24	12/48	1/180

Monochord R A. C. 12000 B. C. 18000
L A. C. 12000 B 18000
Note the tone gap in the right.

ear for the C^2 (512 d. v.) fork, and the monochord not being heard by B. C. indicates clinically the involvement of the inner ear.

Plate IX. Curves of a case of acute serous catarrh of the middle ear due to blocking of and inflammation of the Eustachian tubes by an ulcerated carcinoma of the left tubal orifice and lateral wall of the nasopharynx. Note the sudden drop in the curve about the middle of the range of the audiometer; in the left ear at about 2500 d. v. and in the right a little higher. Also note the tone gap from 3,200 to 3,400 d. v. in the right. From a study of our cases of cochlear involvement in middle ear lesion we conclude that the cochlear involvement is indicated when

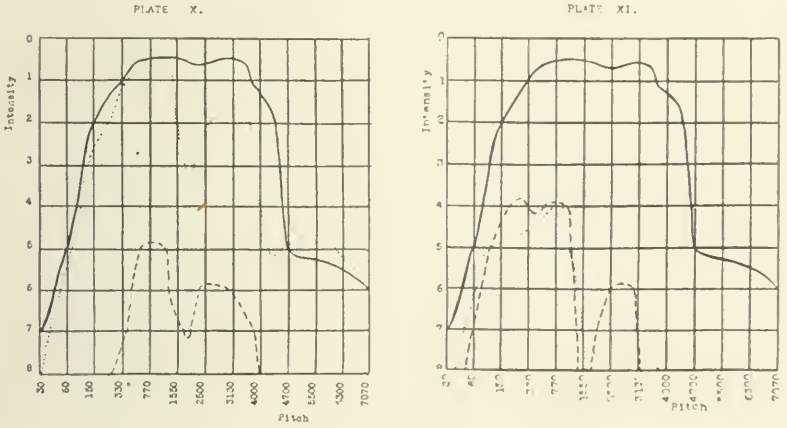


Plate X.

Miss I. W. Age 27.

Diagnosis: Chronic Hyperplastic Otitis Media with Cochlear Involvement.

Voice: Wh. R 0 Sp. 2 ft. B. C. R-5 sec.
Wh. L 15 ft. Sp. 45 ft. L-2 sec.
Galton Whistle R 14500 L 17500
Koenig Cylinders R 30720 L 30720
Monochord R A. C. 12000 B. C. 16000
L A. C. 15000 B. C. 16000

Plate XI.

Mr. S. D. Age 15.

Diagnosis: Chronic Hyperplastic Otitis Media with Involvement of the Cochlea.

Voice: R Wh. 1 ft. Sp. 5 ft.
L Wh. 1 ft. Sp. 3 ft.
B. C. Decreased 2 sec. each ear. (c^2 fork)

Forks 50 d. v.	c	c^1	c^2	c^3	c^4	c^5
R	3/4	3/1	4/8	6/12	0/24	0/48	0/60
L	3/4	3/1	5/8	8/12	0/24	0/48	0/60

Monochord R A. C. 17000 B. C. 20000
L A. C. 17000 B. C. 20000
Galton Whistle R 21000 L 21000
Koenig Cylinders R 43960 L 40960

there is a diminution of the hearing power for high notes more marked than for the low and especially when there is indicated a sudden drop in the curve indicating marked diminution for audition of the higher notes of the range of the audiometer or when tone gaps or deep depressions in the curve, partial tone gaps, are present. The cases with curves showing either of these conditions usually have the upper limit lowered by B. C. when tested with the monochord. This does not happen to be the case in this

PLATE XII.

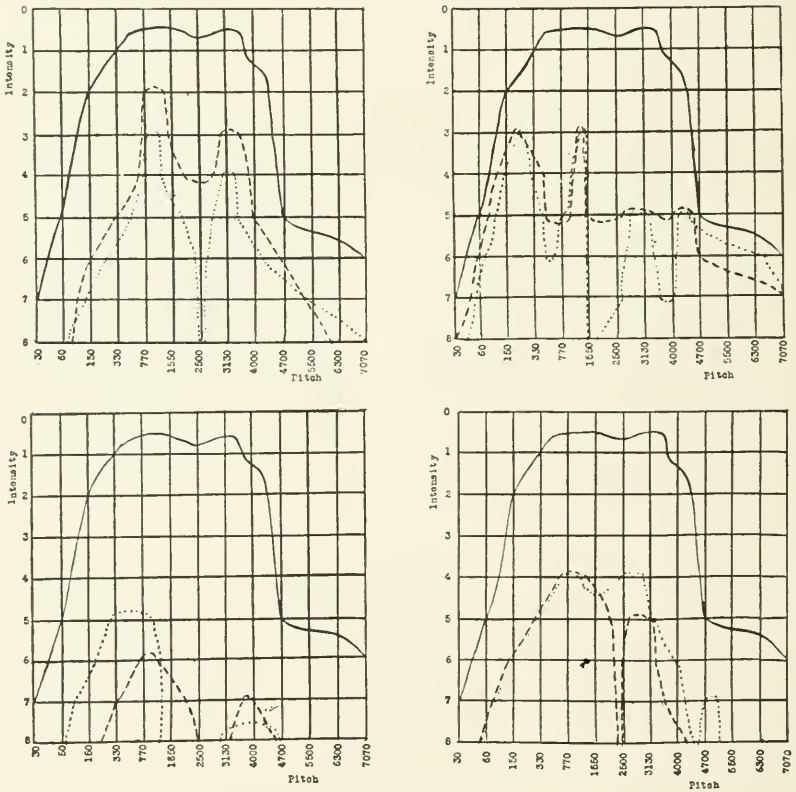


Plate XII.

Diagnosis: Otosclerosis.

instance. In inner ear lesions the upper limit by A. C. and B. C. may be normal.

Plate X. Chronic hyperplastic otitis media with cochlear involvement showing partial tone gap in the curve for each ear.

Plate XI. Chronic hyperplastic otitis media with involvement of the cochlea showing the sudden drop in the curve for each ear at about 3000 d. v. and the presence of a tone gap in each ear, the gap being wider in the curve for the right ear than in that of the left.

Plate XII shows the curves for the right and left ear in four typical cases of otosclerosis. Note the complete and partial tone gaps; also the marked diminution of audition for the notes from 30 to 40 d. v. in each case. Note the difference in the audition of the higher notes of the audiometer range in the case of Miss L. S. and that of Mr. T. T.

During the last nine months nine typical cases of otosclerosis were studied. In every case the right or left ear or both showed complete gaps in the audiometer curve. Of the eighteen ears examined twelve or 66⅔% showed complete gaps.

PLATE XIII

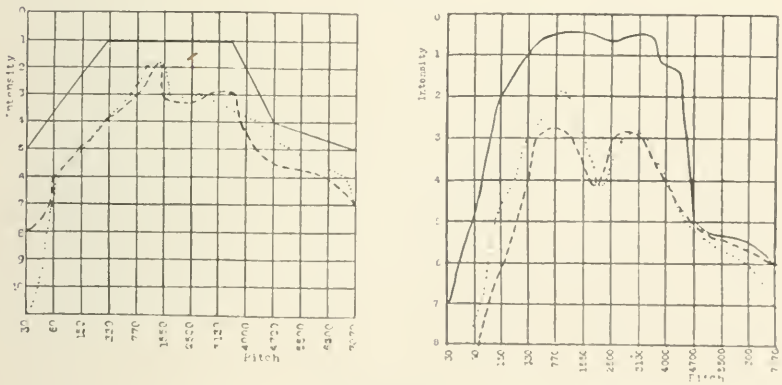


Plate XIII.

Miss R. D. Age 25.

Diagnosis: Otosclerosis.

No. 1.
July 15, 1919.
Voice: R Wh. 30 ft. Sp. 60 ft.
L Wh. 25 ft. Sp. 60 ft.
Curve almost normal. Low notes, Left, Poor. Slight partial gap at about 1700 d.-v.

No. 2.
April 6, 1921.
Voice: R Wh. 4 ft. Sp. 15 ft.
L Wh. 8 ft. Sp. 24 ft.
Low notes much poorer. Partial gap deeper. High notes normal

Plate XIII shows a case of otosclerosis with curves made on July 18, 1919 and a second on April 6, 1921. This was not one of the cases included in the nine typical ones studied. When first seen the only complaint was tinnitis. Hearing rt. W.30 ft., S. V. 60 ft.; lt. W. 25 ft., S. V. 60 ft. A diagnosis of otosclerosis was

made. The first curve was almost normal. Audition for the lower notes left was poor. There was a very slight partial gap at about 1700 d. v.

The second curve, taken about twenty-two months later, showed the progress of the disease. Hearing was rt. W. 4 ft., S. V. 15 ft., lt. W. 8 ft., S. V. 24 ft. The audition for the low notes is much poorer. The partial gap is deeper. The audition for the higher notes of the audiometer range is normal.

Plate XIV shows the curves of a case of acute suppurative otitis media right and left from tubal infection while in swimming. These curves were taken just a few days after the infection developed. Both curves show diminution for the audition

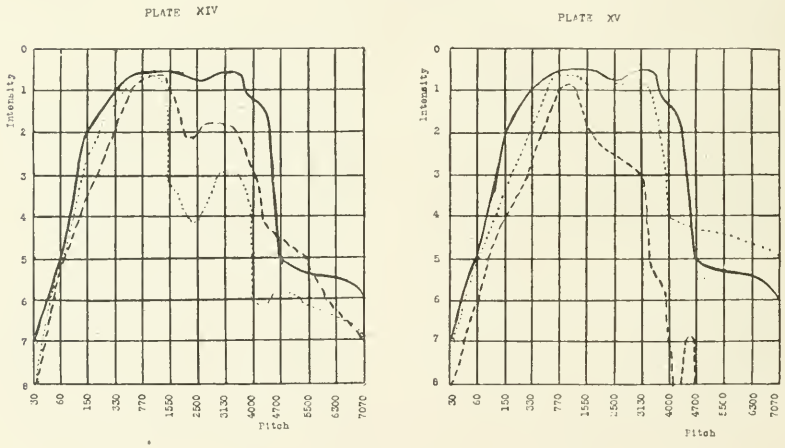


Plate XIV.

Mr. C. V. Age 18.

Diagnosis: Acute Suppurative Otitis Media from Tubal Infection while in swimming. Bilateral.

Voice: R Wh. 4 ft. Sp. 36 ft.
L Wh. 15 ft. Sp. 45 ft.

Forks 50 d. v.	c	c^1	c^2	c^3	c^4	c^5
R	4/4	8/8	10/12	16/18	22/24	40/48	50/60
L	3/4	8/8	10/12	16/18	22/24	30/48	4/60

Galton Whistle R 21000 L 21000
Koenig Cylinders R 40960 L 40960
Monochord R A. C. 17000 B. C. 18000
L A. C. 17000 B. C. 18000

Note that both forks and audiometer show a decrease in the left for the tone c^5 (4096 d. v.).

Plate XV.

Mr. J. S. Age 30.

Diagnosis: Acute Suppurative Otitis Media with Acute Mastoiditis. Right. Left, Normal.
(Curve taken 13 days after Mastoidectomy, Right).
Note the gap suggesting involvement of the cochlea.

of 30 d. v. The sudden drop in the curves about 1500 d. v. and 4000 d. v. together with the partial tone gaps are suggestive of early cochlear involvement. These conditions are most marked in the left ear. By both tuning fork and audiometer the audition for 4096 d. v. is much decreased in the left.

Plate XV shows the curves of a case of an acute otitis right, that required a mastoidectomy. Again the sudden descent of the curve and the tone gap suggests involvement of the cochlea.

Plate XVI shows the curves of a case with chronic suppurative otitis media, right. The curve of the right ear shows a uniform diminution in audition for all tones within the range of the audiometer. There is nothing in the curve indicating cochlear

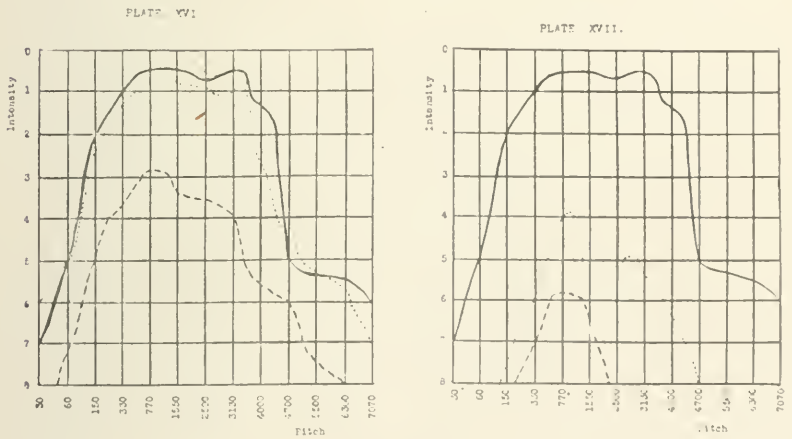


Plate XVI.

Miss A. B. Age 15.

Diagnosis: Chronic Suppurative Otitis Media, Right.
Voice: R Wh. 3 ft. Sp. 6 ft.
L Wh. 15 ft. Sp. 15 ft
B. C. Right and Left, Increased (c² fork).
Koenig Cylinders R 43960 L 43960
Monochord R A. C. 17000 B. C. 17000
L A. C. 19000 B. C. 19000

Plate XVII.

Mr. T. G. Age 11.

Diagnosis: Chronic Suppurative Otitis Media with Cochlear Involvement.
Voice: R Wh. 0 ft. Sp. 6 in.
L Wh. 1 ft. Sp. 3 ft.
Koenig Cylinders R 30720 L 32768
Galton Whistle R 11000 L 11000
Monochord R A. C. 9000 B. C. 14000
L A. C. 9000 B. C. 15000

involvement. The lowering of the upper limit by A. C. and B. C. suggests an involvement of the cochlea. Probably the part of the cochlea involved is concerned in receiving sound vibrations that are above the upper limit of the audiometer.

Plate XVII shows curves of a case with chronic suppurative otitis media, right and left, with cochlear involvement. The sudden drop in the curve for each ear indicates the inner ear lesion. The upper limit in each ear is much lowered by A. C. and B. C.

Plate XVIII shows the curves of a case of chronic suppurative otitis media with perforation of Shrapnell's membrane, right. Left ear normal. Note that the curve for the right ear is practically normal except for the low notes. The tuning fork tests confirm the curve. There is nothing in the curve or the clinical examination indicating a lesion of the inner ear.

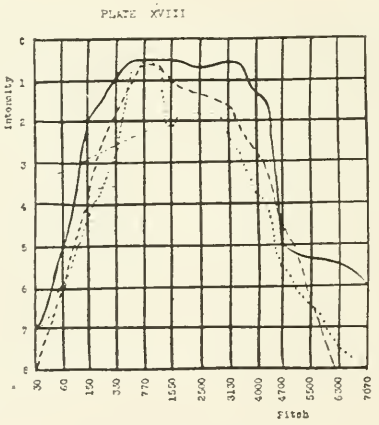


Plate XVIII.

Miss B. F. Age. 7.

Diagnosis: Chronic Suppurative Otitis Media with Perforation of Schrapnell's Membrane, Right.

Voice: R Wh. 10 ft. Sp. 30 ft.
L Wh. 15 ft. Sp. 45 ft.

Forks	50 d. v.	c	c^1	c^2	c^3	c^4	c^5
R		3/4	6/8	10/12	16/18	20/24	34/36	60/60
L		4/4	8/8	12/12	18/18	24/24	36/36	60/60

Koenig Cylinders R 43960 L 43960
Monochord R A. C. 18000 B. C. 18000
L A. C. 19000 B. C. 19000
(Note that the curves are almost normal).

Plate XIX illustrates the curves of four cases of acoustic neuritis. I realize the difficulty in making a diagnosis between nerve and labyrinth lesions and we should rather consider these curves as representing cases presenting the following conditions: hear-

ing for whisper and voice fairly good or normal, B. C. much diminished, upper limit lowered by A. C. and B. C., no history of vertigo, vestibular reactions normal; the disease has been very slow in developing. Note in each instance the sudden descent of the curves in the upper part of the range for the audiometer. It is interesting to watch the return of the curves to normal when the lesion is secondary to a focus of infection in the tonsils and the tonsils have been removed.

PLATE XIX.

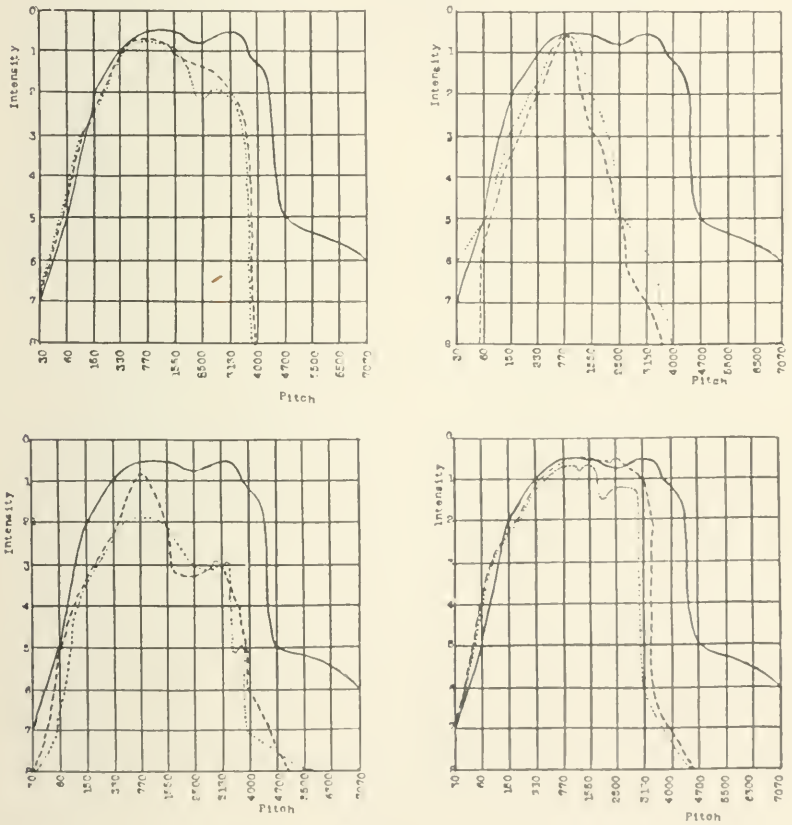


Plate XIX.

Diagnosis: Acoustic Neuritis.

Plate XX illustrates the curves of four cases of neuro-labyrinthitis. In each case the hearing and the vestibular reactions were diminished. Syphilis, mumps, influenza, and meningitis were the etiological factors. Note the sudden descent of the

curves and the tone gaps similar to the findings in the cochlear lesions already exhibited.

Plate XXI illustrates the curves of a case of neuro-labyrinthitis from pellagra. The curves are similar to the curves of cases of neuro-labyrinthitis just demonstrated. The curve is interesting

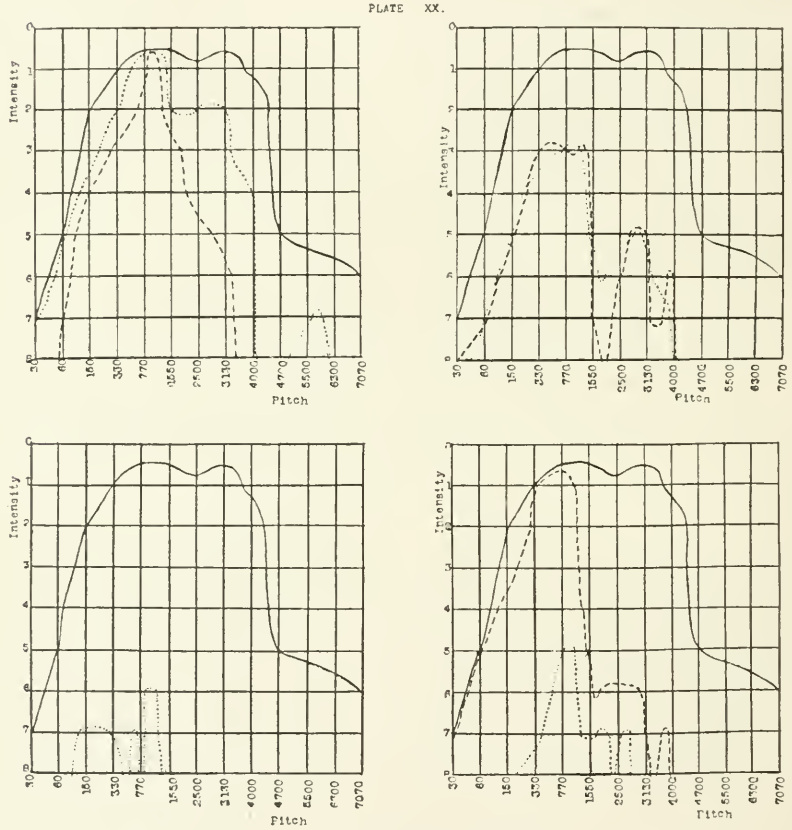


Plate XX.

Diagnosis: Neuro-Labyrinthitis.

in that it illustrates the influence a disease that is probably due to metabolic disturbances may have on the inner ear.

Plate XXII shows the changes in the curves of a case of neuro-labyrinthitis, probably tuberculosis, that improved with the injection of very small doses of new tuberculin subcutaneously The curve of the right ear indicates the greater improvement.

The gap from 4,000 to 5,000 d. v. has disappeared and the curve is higher in the upper part of the range.

Plate XXIII shows the curves of a case of deafness in splenic leukemia. There was no history of vertigo. Vestibular reactions normal.

Plate XXIV shows the curves of the left ear in a patient with hysterical deafness. A curve was taken before any treatment was instituted. The curve is somewhat similar to the concentric contracted perimetric field in hysterical amblyopia. After suggestion, with hearing for voice and whisper normal, the curve approached the normal B. It is interesting to note that after the patient considered herself cured the audition for notes in the upper part of the range of the audiometer did not become normal

PLATE XXI.

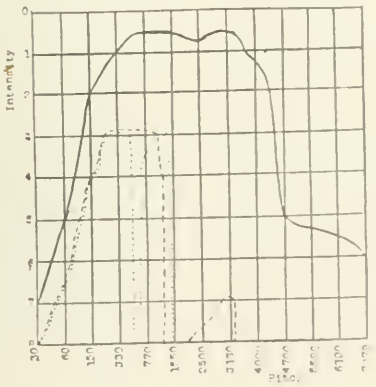


Plate XXI.

Mr. S. H. Age 63.

Diagnosis: Neuro-Labyrinthitis from Pellagra.
Voice: R Wh. 6 in. Sp. 2 ft.
L Wh. 6 in. Sp. 6 ft.
Galton Whistle R 14000 L 14000
Koenig Cylinders R 30720 L 30720
Monochord R A. C. 11000 B. C. 14000
L A. C. 13000 B. C. 15000

This curve suggests the influence of metabolic disturbances on the organ or hearing.

I am under the impression that there are also sometimes permanent defects in the perimetric fields in hysterical patients.

Plate XXV. In our clinic we are accustomed to represent the audition of a patient for a given tuning fork by a fraction, the

numerator expressing the distance the patient hears the fork vibrating from a given impulse and the denominator representing the distance at which the examiner hears it. When the assistants in the clinic have normal hearing for voice and whisper their comparative results have formed a part of the clinical chart of our cases.

PLATE XXII

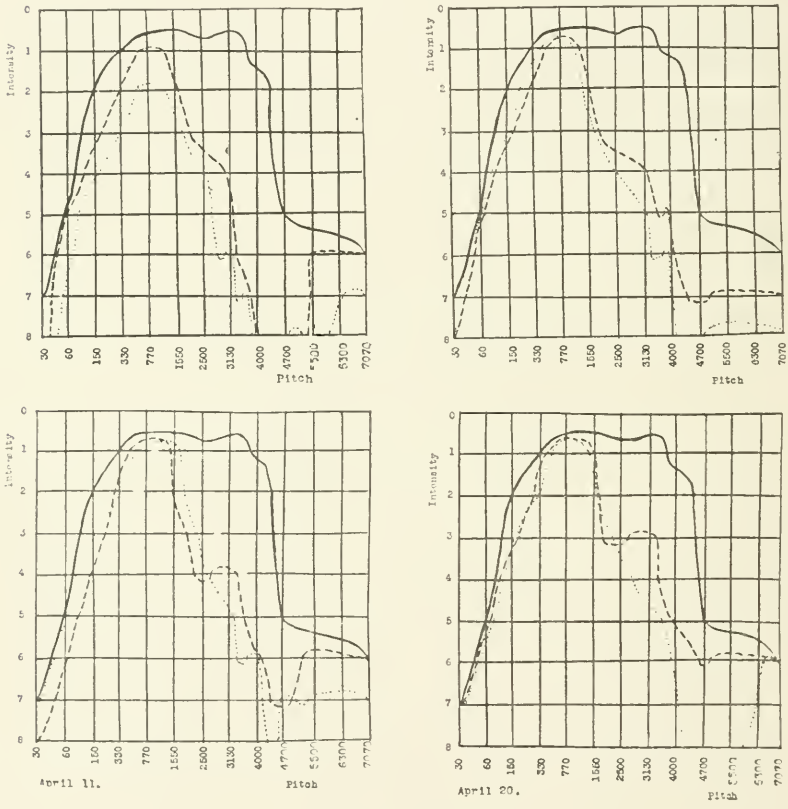


Plate XXII.

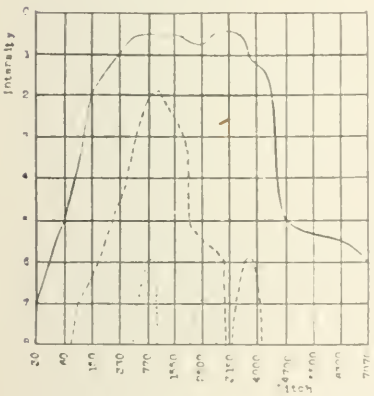
Diagnosis: Neuro-Labyrinthitis. Tuberculous (?).
Curves show improvement with the use of small doses of new tuberculin subcutaneously.

The six assistants at present in the clinic were tested with the audiometer. Two of the six had defective curves. In the case of Dr. N. the audition of notes from 4,000 to 7,070 d. v. was

diminished: in the case of Dr. S. from 4,000 to 5,500 d. v. Testing these men with the C⁷ fork confirmed this defect. Consequently all observations made by these examiners using the C⁷ fork were not reliable and the clinical charts of the cases examined by them were defective. It is not unusual to find this type of curve in smokers. In the case of Dr. N. the upper limit by A. C. and B. C. was lowered. In the case of Dr. S. it was normal.

Mr. Bunch tells us that Dr. J., a third assistant, who had a perfectly normal curve developed a pneumonia since I left Iowa City and since then has a defect in the upper part of the range of the audiometer.

PLATE XXIII.



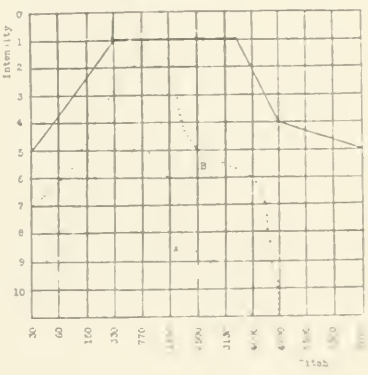


Plate XXIII.

Mr. Wm. E. Age 60.

Diagnosis: Leukemic Deafness
Voice: R Wh. 8 ft. Sp. 15 ft.
L Wh. 0 ft. Sp. Loud voice close to ear.

Forks 50 d. v.	c	c^1	c^2	C^5	c^5	c^6
R	1/4	2/8	2/16	12/24	10/36	30/48	2/60
L	0	0	0/16	0/24	0	0/48	0

Galton Whistle R 12000 L 10500
Koenig Cylinders R 27306 L 27306
Monochord R A. C. 7000 B. C. 14000
L A. C. 7000 B. C. 12000

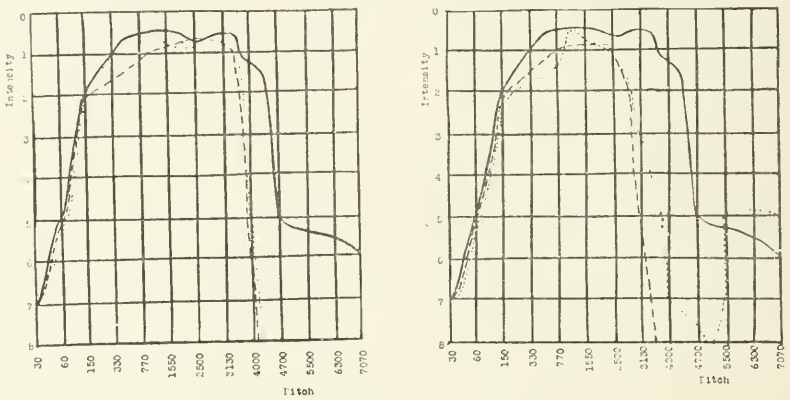
Plate XXIV.

Mrs. B. Q. Age 41

Diagnosis: Hysterical Deafness. (Left)
Curve A. Before electrical treatment with suggestion
Curve B. After treatment.
Voice: Before treatment Whisper 1 ft. Spoken 2 ft.
After treatment Whisper 15 ft. Spoken 15 ft.
On discharge, all tones normal except for decrease in tones above 1000 d. v.)

It has been a source of regret to us that we have not had opportunity to autopsy any case which has furnished an interesting audiometer curve. Only after cases have been tested with the audiometer and a careful post mortem study has been made of the organ of hearing will we have conclusive evidence as to the significance of the defects in the audiometer curves.

PLATE XXV.



Curves of Assistants in Clinic.

No. 1. Notes above 3800 much decreased in both. Upper limit much lowered. (Galton and Monochord.)

No. 2. Notes above 3100 in right much decreased. Gap between 4000 and 5500. Upper limit normal.

A DEMONSTRATION OF THE PHYSICS OF SUCTION APPLIED TO THE NOSE WITH MODIFICATION OF THE USUAL TECHNIC.

By SAMUEL IGLAUER, M. D., Cincinnati, Ohio.

In recent years the use of suction apparatus has become very popular in the diagnosis and treatment of exudative diseases of the para-nasal sinuses. The simple rubber bulb suction outfit originally used has in a large measure been supplanted by the electric vacuum pump, which is much more effective in action. Unfortunately, despite these technical improvements but little attention has been paid to the physical principles underlying the use of negative pressure, and judging from the report of a discussion of this subject, (Laryngoscope, 1) considerable confusion seems to exist regarding these principles. A disregard of the physics involved has also at times led to extravagant claims for this method of treatment, which are not warranted by the facts.

Many years ago Uffenorde (2) presented a critique of this subject and employing a rubber suction bulb, performed some experiments on the antrum of the cadaver to explain the physics involved. Herrmann (3) also explained the physics somewhat empirically and based his statements chiefly on clinical evidence.

The experiments which I have performed have been with the electric pump and are similar to but not identical with those of Uffenorde. From the standpoint of physics and for purposes of demonstration, any accessory sinus of the nose may be likened to a glass retort having a single narrow outlet. The position of this outlet varies according to the anatomic structure of the particular sinus. In the frontal sinus the outlet is at the bottom of the cavity; in the antrum and sphenoidal sinuses it is very near the top; with the ethmoids the position of the outlet varies with each individual cell.

If such a retort be partially filled with water and have its neck connected by tubing with a suction pump, and if in addition a vacuum guage be attached, air tight, above the fluid in the retort, we can reproduce very closely the physics of artificial suction applied to the para-nasal sinuses. (Fig. 1.)

Experiment 1. With the retort connected as described above, with the level of the contained fluid below the outlet of the retort, it is evident that upon creating a partial vacuum in the outlet of

the retort, there will be no movement of the fluid within the vessel, and that the vacuum gauge on the pump and on the retort will register the same.

Experiment II. If the retort be tilted so that the fluid covers the outlet and if a partial vacuum be created in the outlet, the supernated air in the retort will be under greater pressure than that in the suction bottle and this unbalanced pressure will force some of the fluid out of the retort. As this occurs the air in the retort may be seen to expand until the vacuum reading in the retort and pump become the same, when the flow will cease. (Fig. 1).*

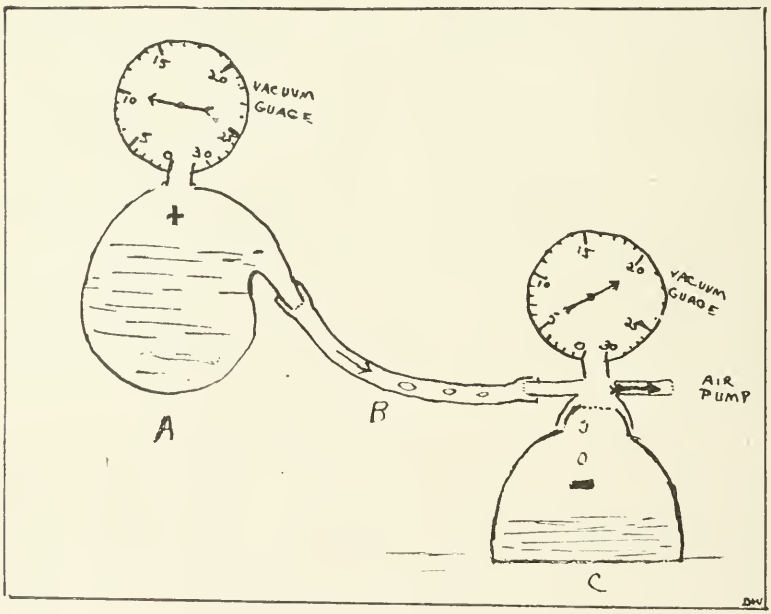


FIG. I

In order to withdraw more fluid from the retort the partial vacuum within the latter must be overcome by removing the suction attachment, permitting air under atmospheric pressure to bubble into the retort. Suction may then be reapplied when more fluid will be withdrawn. In order to completely empty the vessel, negative pressure alternating with the admission of air must be em-

*Fig. 1. A represents a paranasal sinus partially filled with fluid. B represents the nasal chamber. C a suction bottle applied to the nostril. When a partial vacuum is created in C, a vacuum is also created in A, but at first a lesser vacuum than in C, as indicated by plus and minus. The unbalanced vacuum readings in A and B become the same, when the flow will cease.

ployed a number of times, depending upon the degree of vacuum, the diameter of the outlet and the relative amount of fluid and air originally contained within the retort.

Experiment III. A Carrel tube sealed at one end and having two small lateral openings was used. Two retorts, one containing fluid and the other empty were attached to these lateral openings. Suction was then applied to the open end of the Carrel tube, drawing fluid from the retort into the latter. Upon interrupting the suction and permitting air to rush in, it was found that some of the fluid was forced into the previously dry retort. In this experiment the Carrel tube represented the nasal cavity and the two retorts accessory cavities.

The clinical application of this experiment lies in the possibility of drawing pus out of one sinus and by very suddenly changing from negative to atmospheric pressure forcing the pus into a neighboring and unaffected sinus.

In order to reproduce these experiments under conditions almost identical with clinical experience, the following procedure was adopted:

Experiment IV. Roentgenograms of the head of a cadaver were taken to determine the shape and size of the frontal sinuses and antra. A round trephine opening was then made into the external wall of each of these sinuses. A thick flat piece of glass accurately ground to fit each trephine opening was then inserted as nearly air-tight as possible, (putty or cement). This glass served as a window through which the behavior of fluids within the sinus could be observed under varying conditions. A small secondary accessory opening was drilled into each sinus. Through this opening the sinus could be filled with fluid after which the opening could be plugged with a stopper. The posterior nares were closed air-tight with rubber balloons. The suction nozzle was then applied to the anterior naris. The fluids used were either water, or preferably starch water which more closely resembles pus in consistency.

Experiment V. Under these conditions with the head erect and the antrum almost full, suction failed to lower the level of the fluid. If, however, the head were tilted forward and inclined to the opposite side, suction partially emptied the antrum. Upon discontinuing the suction, air could be seen bubbling into the antrum to replace the partial vacuum previously induced by the suction. By repeating this process the antrum could finally be practically emptied.

Experiment VI. Frontal Sinus. The outlet of the frontal sinus was partially plugged with cotton simulating an inflamed mucosa. When the sinus was nearly full of fluid the latter did not gravitate into the nose. With the head erect upon applying suction, part of the fluid was withdrawn. Interrupting the suction, air could be seen entering the cavity. Upon reapplying suction the sinus could be emptied. It will thus be seen that the behavior of fluids in the sinuses was practically identical with that of fluids in the retort.

It may be inferred that to empty the sphenoid it would be necessary to tilt the head forward. The position of the ethmoid openings are too variable for any general rule.

The experiment of drawing fluid out of one sinus by suction and then admitting air, has not been reproduced entirely to my own satisfaction and requires further trial.

The practical conclusions to be drawn from these experiments are:

First, in order to drain a sinus by negative pressure, the head must be placed in the most favorable position, that is with outlet of the sinus in the most dependent position.

Second, suction should be interrupted to permit air to force its way into the sinus.

Third, the inrush of air after suction may force part of the secretion withdrawn from a diseased cavity into an adjoining sound cavity. This may be obviated by preventing a too sudden inrush of a large volume of air.

Fourth, these experiments do not take into account the pressure due to exudation of fluid in an inflamed closed cavity.

A Modification of Usual Therapeutic Technic.

The usual method of inducing negative pressure within the nose consists of applying the nose-piece of the suction bottle within the nostrils, while the other nostril is being blocked by finger pressure, the patient meanwhile closing off the pharynx by phonating or swallowing. The objections to this method are that continuous suction cannot be maintained, while the closure of the pharynx is often incomplete, and the patient is apt to complain of the disagreeable sensation in the throat and ears during the proceedure. As Wells, (4) puts it, "The chief drawbacks to the use of ordinary suction are first the

force necessary to be effective is generally attended with considerable pain and second we cannot exclude the Eustachian tube from its action." According to the brief statement of Coffin (5), "The nasal chamber may be closed either by instructing the patient to say Ka-Ka-Ka, or the ballooning of a small rubber bulb in the choanae."

Most of the objections cited above may be obviated by balloon closure of the choana, and it is concerning this method that I wish to speak more in detail.

The technic is as follows: The inferior meatus is first cocainized. The finger of a rubber glove makes an admirable balloon. It is inflated to the size of a walnut (using a Politzer bag) and tied off with a cord, having one long, and one short end.

To one end of a soft rubber catheter a piece of cord about two feet long is tied. The catheter is then passed through the nose and withdrawn through the mouth, bringing the cord after it. This is simpler than the usual method of fishing the cord out of the pharynx.

The catheter is now detached and the balloon tied to the end of the cord protruding from the mouth. The balloon is then drawn into the choana by traction on the nasal end of the string. It is held by the patient or by the weight of a hemostat.

In addition to this method, I have tried to introduce a long-stemmed balloon through the nose and inflating the balloon after it reaches the pharynx. I have also used the Boetscher inflatable postnasal bag, but neither of these methods is as satisfactory as the one described above.

With a balloon in place one can induce continuous negative pressure in the nasal chamber with but little discomfort to the patient. Sensible children will also tolerate it. My youngest patient was a boy, aged 10 years, who received numerous treatments with much benefit. A girl 16 years old, suffering from pronounced ethmoiditis, recovered after fourteen treatments, although at first it appeared to be an operative case.

The treatment may be prolonged over a considerable period, and the patient can tolerate a higher vacuum up to twenty or twenty-five inches of mercury. Suction may be alternated with air admission as desired.

In conclusion it may be stated that this method greatly enhances the value of negative pressure in the treatment of sinus disease.

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DISCUSSION.

Dr. Wm. B. Chamberlin, Cleveland, O., asked Dr. Iglauer if he always had to cocainize the naso-pharynx before introducing the instrument. Dr. Iglauer said yes.

Dr. Lewis A. Coffin, New York, said that as a demonstration of the physics of suction, Dr. Iglauer had not left much to be said. The speaker had tried to get up some apparatus like that with glass blowers, but he was not successful. The conditions in the cadaver were not exactly the same as in the living body. Dr. Iglauer brought the suction down to a certain point, but in the living body there were the blood vessels and mucous cavity so that more fluid might be obtained. In his own apparatus he had a means of introducing air. In regard to the nasal balloon method, it was easier to give 25 inches, but 16 were enough. It did not affect the ear, if normal, but it might do harm.

Dr. W. A. Wells, Washington, D. C., said it was very gratifying to see one of their fellows coming back to fundamental principles of physics, by which some defects in present methods could be discovered. He had always felt that suction did not accomplish as much as had been claimed for it. Dr. Iglauer had attempted to obviate the effect on the middle ear and tube. The speaker had always felt that in acute inflammations of the sinus there were obvious disadvantages from the increased congestion which one must get from the use of the suction method. Suction of the mucous membrane would further narrow the opening and bring effects to be avoided, such as interference with ventilation. One should consider the three objects to be obtained by the use of any treatment: (1) removal of the products of secretion; (2) drainage; (3) ventilation; accomplishment of one, to the detriment of the other was disadvantageous. Dr. Coffin's method brought air into the cavities. This had a therapeutic effect. He thought that Dr. Iglauer had demonstrated the physics underlying Dr. Coffin's treatment. These demonstrations appeared to rest on a sound basis and if they could be carried out in practice they would give new lines to work upon.

Dr. Sidney Yankauer, New York, said one point was omitted: in addition to the mucous membrane there were openings in the bony walls, and the veins and arteries; the volume occupied by secretion must be replaced by blood and serum through the openings. With air in the sinus, negative pressure in the ear would act upon the fluid and upon the mucous membrane as well and produce swelling of the mucous membrane in the sinus, although it would be less if the sinus were full of fluid. This should be borne in mind in estimating the use of these devices. Putting a cupping glass in could result in drawing blood by vacuum effect.

Dr. Harmon Smith, New York, said that too much pressure was applied in suction. He presented an instrument at the New York Academy of Medicine at the same time as Dr. Coffin. The vacuum was attached to a tube which liberated medication, iodin, argyrol, etc., which would wash out material at the same time, and pus had been obtained after employment of other suction methods. Suction was not enough, it must be suction plus surgery, plus medication.

Dr. Greenfield Sluder, St. Louis, said that this was a very beautiful demonstration, and he would like to recall an incident which fixed the value of suction on well selected cases. A woman had become blind over night. The sphenoid and ethmoids on the right side were swollen and edematous. Suction was applied and the vision returned while the machine was attached sucking at the nose. One such case was all that was needed to clinch the value of suction in obstructed cases.

Dr. S. Iglauer (closing) said that Dr. Coffin would find the balloon method gratifying, if he followed it up. Suction did not damage the middle ear, but it was unpleasant to the patient. The palate could not be held against the posterior pharynx for any length of time. With the balloon one could continue as long as necessary. Children would tolerate it. Sometimes cocainization was necessary. In regard to edema, exhaustion of fluid caused its replacment by air. Bleeding did not occur unless there was varix or puncture. A high degree of vacuum did not produce hemorrhage. He did not see why Dr. Smith could not direct the fluid into any cavity, but there would not be any ill effect from putting argyrol into a healthy sinus. If Dr. Sluder's patient were not hysterical, suction did the work.

THE MANAGEMENT OF RECENT FRACTURES OF THE NOSE.

By LEE COHEN, M. D., Baltimore, Md.

I wish to place before you a method of treatment which has yielded uniformly excellent results, both as to the external appearance of the nose and prevention of obstructive conditions within which only too often follow fractures. At the same time I feel also constrained to mention my deep conviction that the rhinologist should apply himself seriously in the matter of impressing upon the general medical profession the importance of early and prompt treatment of nasal fractures, lest the same chaotic state of mismanagement which has heretofore prevailed continues.

Only recently an instance was brought to my attention where the nose of a boy of fifteen was badly broken by a baseball. When seen by the family physician a few hours afterwards he was advised to wait a month before having the "bones set"; a month later, on returning, he was told that it would be best to wait one year before attempting to correct the *now* existing marked external and internal deformity. This may be an extreme instance of the indifference of the general man to the need of seeking expert advice, in such cases, but other instances are constantly being brought to the notice of many of us wherein the patient is dismissed with a simple strip of adhesive over the nose, or told that with the disappearance of swelling all will be well.

However, since most cases are first seen by the general man when the extent of the injury is frequently masked by the enormity of the swelling, it is not surprising that one untrained in this work should fall into such error. Besides, in a survey of the literature appearing in the past twenty-five years, one is amazed at the small space allotted to the discussion of this subject in most text books, and at the utter lack of unanimity in the methods of treatment. All do agree that the constituent parts of the nose should be set in their proper anatomical position—some say immediately, while others advise waiting four or five days for swelling to disappear.

To retain the nose in position the methods mentioned are so varied and often so ambiguous as to leave one beginning the study of the subject largely at sea. Transfixing the nose with pins just

beneath the lower ends of the nasal bones, the use of internal metal splints made fast to the teeth by complicated dental appliances, the placing of Simpson's sponge splints, or the perforated hard rubber splints of Asch within the nose, and finally packing the nasal vestibule with gauze, may be mentioned as the types of internal support advocated. As to the use of an external support, many contend that none is necessary; that the nose once placed in

proper position tends to remain there, supported only from within. This is certainly at variance with my own experience, and likewise with that of others who have given much thought to this matter. Plaster casts, hard rubber splints and other types of stiff plaster molds have been employed. None with which I am familiar, however, are so easily made and applied, or so effective, as the simple copper splint, held in place by adhesive. This type was first used by Dr. John O. Roe in his work on nasal deformities.

The advantages of this splint are manifold. The equal pressure exerted by it over the entire nose holds all fragments in absolute alignment, and prevents their outward displacement, thus diminishing callus formation along the lines of fracture to a minimum. Ridges, offsets, and other irregularities in the contour of the nose, so prone to follow fractures, and due to such callus, are thereby prevented. This splint also hastens the disappearance of swelling, and gives to the nose a uniformly good shape not to be obtained

by any other which I have tried. Held in place securely with adhesive, trauma and possible refracture during the process of healing are prevented, and lateral deviation of the nose from the middle line of the face so frequently observed after these injuries is obviated.

An experience of some years in corrective rhinoplasty convinces me that the majority of acquired external nasal deformities and a vast number of septal deflections are the end results of

fractures faultily treated. The effects of these nasal obstructions in the production of serious local and systemic disturbances are too well known to dwell upon here.

What then should be done to impress upon the general medical men the seriousness of treating lightly injuries of this character? My feeling is that the rhinologist should go before the medical societies in his locality and there emphasize the importance of the same prompt expert treatment of fractured bones of the nose as

that accorded fractures of other bones; that such cases should be directed to someone able to ascertain the extent of the injury inside the nose as well as outside, and who has been trained to afford the necessary relief. For correction immediately following the injury is a simple matter, as you know, compared with the extensive operative procedure required at a later period.

It has been said that fractures of the nose are infrequent in comparison with other bones of the body. P. Bruns stated some

years ago that in over 40,000 patients treated in the clinics and hospitals of Berlin only 1.1 percent had fracture of the nose. Gurlts estimated that only 1 percent of all fractures applying for treatment were of the nasal bones. These estimates, it must be apparent to all, are ridiculously low in this country, where football, baseball, basketball and other sports are a regular part of the school life, and where automobile accidents and boxing also furnish a liberal quota.

No time need be spent before this Society in general anatomical consideration, but it is well to bear in mind that the nasal bones are quite thin at the lower extremity; hence, fracture is most prone to occur at their lower third, and it often requires only a slight blow from the side to cause a break. Also the extent of articulation between the perpendicular plate of the ethmoid and the nasal bones is variable. Zukerkandl found in a large number of skulls that the bony septum extended as far down as the middle of the nasal bones in forty per cent., to the junction of the lower and middle thirds in 38 per cent., only to the junction of the upper and middle thirds in 10 per cent., and finally in 3 percent. the bony septum did not reach the nasal bones at all. In isolated instances, therefore, extensive fractures of the nose may occur without involving the bony septum. In such cases, the cartilaginous septum is always broken or displaced, and this makes retention of the nose in the middle line of the face at the time of correction a more difficult task.

Detection of fracture is on the whole easily accomplished. A careful comparison of the relationship of the middle line of the forehead and of the chin with the tip of the nose is often sufficient to convince one of the existence of fracture. Palpation enables us to ascertain whether the break involves one or both nasal bones, and to detect any displacement or irregularity in the contour of the nasal arch. Crepitus may in most instances be elicited. X-ray may show the extent of the fracture, but is by no means essential in making a diagnosis. Inspection of the interior of the nose discloses the extent of septal injury.

Treatment should, in my opinion, be instituted as soon after injury as possible, without awaiting the disappearance of swelling, no matter how great this may be. Even in compound fractures, where suturing of a wound was found necessary, this principle has been followed with the utmost satisfaction. At times it has been deemed wise to give a preventive dose of tetanus serum. The administration of ether has been found best in all cases for the

actual operation. After the patient is asleep the extent of the injury and amount of displacement can be better ascertained. A postnasal tampon is introduced to prevent blood finding its way into the nasopharynx.

In young subjects, where organic matter in the bones preponderates, a tendency to lateral deviation of the nose after reduction often exists. This has been especially true where a blow from the side results in a complete fracture of one nasal bone and only a partial fracture of the other,—so-called *greenstick fracture*. Satisfactory reduction in such cases cannot be accomplished until all resiliency of the partially fractured bone has been removed by making the fracture a complete one. In other words, in all cases when the nose fails to remain in the proper position after being so placed, it must be so thoroughly mobilized by such further fracture that the flail nose can be molded to suit oneself. For this purpose, the Adams forceps generally serves, but at times the hammer must be called into requisition.

In other cases where the nasal bones can be placed in absolute alignment, there may still exist a tendency to lateral deviation of the entire nose from the middle line of the face, on account of septal displacement. Moreover, there may also exist a depression along the dorsum nasi from the same cause. Replacement of the septal fragments and elevation of the dorsum to the proper plane often requires considerable force. This can best be supplied also by the Adams forceps or one of its modifications. With one blade on each side of the septum, parallel with and just beneath the bridge, the entire nose is, as it were, lifted forcibly forward and upward, moderate pressure being simultaneously exerted on the septum. Generally during this manipulation the slipping of the bones into place can be felt.

Mobilization once accomplished, the replacement of fragments, with a small rubber covered elevator held in the right hand and manipulated from the inside of the nose, while the left hand of the operator remains over the outside, presents little difficulty.

Reduction satisfactorily completed, the anterior portion of both nasal fossae and vestibules are packed with half inch iodoform gauze tape. No other form of internal support can be applied with such precision, so that greater or lesser pressure may be placed where required; not only is the septum kept in place, but the fragments of the nasal bones, no matter how badly comminuted, are prevented from falling inward out of alignment. The fingers of

the left hand held over the nose during this process prevents forcing of the fragments outward by too tight a packing.

The external splint should now be applied. Since the publication of a monograph "The Necessity for Prompt Management of Fractures of the Nose" in The Military Surgeon of November, 1918, a number of inquiries have been received as to the splint there mentioned, and its mode of application. One of our leading instrument makers recently wrote asking directions for making it, saying he had orders for same, but as each splint must be made for the individual case as it presents itself, such blanket instructions would be useless. I shall, therefore, endeavor by means of the motion picture to show the procedure of making and applying the splint.

We first proceed to make a paper pattern. A strip of paper is held across the nose, extending from the frontal notch to tip. A pencil dot on each side of the nose, just above the inner canthi, indicates the limit of the edges of the pattern above, while a dot on each side, in the naso-labial crease, indicates the limit of the edges below. This pattern is then folded down the center, so that the dots on one side of the nose oppose the corresponding ones on the other side. Thus folded the pattern is cut in rounded form from one dot to the other. When completed this paper pattern furnishes a true model from which the splint is made. It is now laid on a sheet of 20 gauge copper and its outline marked, after which the metal is cut with a small pair of tinner's shears, and covered on both sides with adhesive. It is then bent over a piece of iron pipe,—in this instance the screen frame answered the purpose. Thus bent a perfect mold is formed to fit over the nose like a saddle. The splint is now lined with surgeon's lint, on the smooth side of which adhesive plaster has been stuck to give it body and prevent wrinkling.

The splint so made is held in place by a 1¼ inch strip of adhesive applied in the following manner. One inch from its end a notch, to be placed beneath the right ear, is cut in the upper edge, and the strip made fast to the right cheek which is pulled forward, as the adhesive is drawn snugly over the top of splint. The left cheek is now held forward and the adhesive made fast thereto, passing beneath the left ear where a similar notch is cut in the upper edge. The cheeks thus pulled forward, furnish the elasticity necessary for even and continuous pressure of the splint. Bands of garter elastic and other materials first tried were discarded, for two reasons: firstly, they had a tendency to slip,

and secondly, in passing around the nape of neck interference with the return circulation caused headaches.

While applying adhesive strip, splint must be firmly held with left hand of operator to prevent displacement of nose. The eyes are completely covered with adhesive when first applied; subsequently the upper half of the strip, extending from one outer canthus to the other, is cut away to make space for vision. The strip is now too low down on the splint, and unless placed on a higher level so that pressure is brought to bear about the middle of the bony arch, depression of the nasal tip is likely to result. Likewise the tension of the adhesive on each side of strip must be equalized, lest lateral deviation of the nose follow. Palpation of strip, with one index finger on each side, will detect the slightest inequality.

Balancing tension and placing adhesive strip on a higher plane is accomplished by means of a small elevator, made for this purpose, heated quite hot over a spirit lamp to prevent adhesive sticking to it. This hot elevator is passed from below upward, between splint and adhesive, and the strip raised clear of the splint. Thus held the plaster may be shifted to any desired position. A pencil dot in center of upper edge of splint, and one directly below it on upper edge of strip, aid much in judging the extent of change made in shifting the adhesive.

Last, an additional strip of adhesive half inch wide is placed vertically from the lower end of splint over the middle of forehead to the hair line. This strip, reinforced with two cross strips on the forehead and two over the splint itself, prevent it from slipping downward.

Perforations in the splint, made by a small dental punch, add greatly to the comfort of the patient and lessens masceration of the skin during hot weather.

The external splint is worn over a period of four weeks, but changed every fourth day, at which time the skin beneath is cleansed with alcohol. Packing within, while changed every third day, is discontinued after the tenth day.

Photographs here shown are of a 16 year old boy, struck on the nose with a baseball. He was discharged only a few days ago, having worn the splint one month.

DISCUSSION.

Dr. William Wesley Carter, New York, said that the nose must be considered mechanically, surgically, and architecturally as an arch and the columns must be placed in such a line that the integrity of structure was preserved. The early treatment of injuries of the nose was very

important. These cases came to the general practitioner first, and he should refer them to the man who understood the mechanism of the position of the segments. After scar tissue had formed it was difficult to correct the deformity. The sutures were through the dorsum of the nose to pull the apex of the arch into proper position on the splint, holding the parts in position ten days. The bridge splint preserved the integrity of the arch.

Dr. Ira Frank, Chicago. Why did the doctor wait to reset the fractures until the swelling had subsided. One got a better result by working at once under anesthesia.

Dr. Joseph C. Beck, Chicago, said that Dr. Carter had emphasized the importance of preserving the integrity of the parts. The X-ray diagnosis was of great value in the treatment. It was not so important to hurry, as it was to wait till the marked reaction had subsided, when general anesthesia could be employed. He had made use of a through and through suture, with a silver wire, tying over the ends with the splint inside.

Dr. Lee M. Hurd, New York, said he never used general anesthesia. He had made use of iodoform gauze packing. He had used morphine and hyocin, and lifted up the fragments from within, and the pieces could be set up like a house of cards with support inside of the arch of the nose. Sometimes there was also a fracture of the septum which would have to be corrected.

Dr. B. R. Shurley, Detroit, Mich., said that he had had some experience with broken noses at the time when he was captain of a football team. A broken nose then was considered more or less of a joke. The trouble was that these cases rarely fell into the hands of the rhinologist. The general surgeon got them, and the public did not know that the rhinologist was competent to treat these cases. It was more important to reset the parts than to consider the cosmetic result from the standpoint of injury to the skin. The speaker said he had been successful with the modified Asch Splint.

Dr. Stivers, (by invitation), said that aviation had been responsible for an increase in the number of these accidents. The cowl of the machine was just in front of the aviator's nose, and if he fell he was thrown against this, so that this condition could be looked for in aviation accidents.

Dr. G. F. Keiper, Lafayette, Ind., said that a man with a previous fracture of the nose often sustained a new fracture, and the nose could be improved subsequently. The best plan was to get a photograph of the individual before the injury and work from that. Then the patient could not blame one, as he was apt to, if his looks were spoilt. Aluminum was satisfactory for making external splints, although not so flexible as the rubber splint.

Dr. Harris P. Mosher, Boston, said that in doubtful cases anesthesia could be given to see if there were fracture or not. Simple cases did not require a splint. For internal splints copper or aluminum could be used with internal packing.

Dr. S. Iglauer, Cincinnati, said he did not set the cases too early. When there was much swelling one did not know what the patient looked like, and if one waited a few days one got a better idea. One must be careful not to bruise the opposite side. Sheet lead gave better results than copper. Adhesive plaster covered with collodion was useful.

Dr. Lee Cohen, (closing), said that Dr. Carter's splint was useful in maintaining the arch of the nose, but not in maintaining the lateral contour of the nose at the junction of the nasal bones. So far as waiting until the swelling had subsided, if a saddle splint were employed, time could be saved by not waiting. A copper splint could be used, wide at first, and then made narrower as the swelling subsided.

RADIUM IN THE TREATMENT OF EPITHELIOMA OF THE NASAL CAVITIES. THE REPORT OF A CASE WITH REVIEW OF THE LITERATURE.

By DUNBAR ROY, M. D., Atlanta, Ga.

Mrs. S. B. R., white—age 42, of Toccoa, Ga. Patient consulted the writer on account of some soreness and stopping of the left nasal cavity which had been present for several months.

History—Patient was of an unusually strong and healthy looking physique. Weight 160 lbs. Had never had any severe illness nor chronic complaints which necessitated the consultation of a physician. No history of any malignant disease in her family. Her only complaint was susceptibility to colds in the head.

Present History. For the last three months has had some irritation and some stopping of the left nasal cavity. This was accompanied by scabby condition and an occasional bloody discharge. She had been able to see a small growth just within the external opening on the outer side which was evidently increasing in size.

Examination. No external swelling or congestion. No enlargement of the cervical or submaxillary glands. On inspection just within the left nasal cavity could be seen a small growth at the anterior end of the inferior turbinate close to the muco-cutaneous margin. It was dry and about the size of a bean, slightly scabby sessile in form with a slight tendency to bleed if touched. The patient gave no history of nose bleed. To all appearances the growth gave every indication of being a fibrous papilloma. Under cocaine anesthesia the growth was very easily removed with the cold wire snare and the raw surface cauterized with the electro-cautery. There was very little hemorrhage.

The growth was submitted to Dr. John Funke, pathologist who gave the following report.

"Specimen consists of a reniform mass 1.2 by 0.6 by 0.4 cm. which is reddish grey in color and rather firm.

Microscopic examination:—The sections are surrounded by a stratified layer of squamous epithelium which at one point is clearly destroyed by a very small ulcerated area. Extending from this area for a short distance the superficial portion of the epithelial stratum is undermined. The structures underlying the ulcerated and undermined area are infiltrated with cells which for the most part are arranged in plugs, but some are in long strings. These cells are polyhedral in shape, are about the size of the cells occupying the lowermost portion of the epithelial stratum. They stain well especially the nucleus. The protoplasm is granular and rather scanty.

The stroma is abundant, strains rather feebly and contains a few blood vessels.

Diagnosis:—Basal cell epithelioma."

Subsequent History. The patient returned in one week's time, showing no signs of reaction and nothing more upon the surface than would be expected from the removal of a benign growth. A sedative ointment had been given to be used in the nasal cavity.

Nov. 16th, 1919, three weeks later the patient was again seen. There was considerable irritation inside the nose accompanied by scabbing and bleeding. The patient said she felt very uncomfortable. She was then referred to Dr. O. D. Hall for radium treatment. I saw the patient at intervals during the radium treatment, but only for observation. The radium was used as follows, being placed just inside the nasal cavity and properly screened.

Nov. 15th, 1919. 50 milligrams. Time two hours.

Dec. 15th, 1919. Same amount. Time 4½ hours.

Feb. 11th, 1920. Same amount. Time 2½ hours, making a total of 450 milligram hours.

Jan. 15th. Examination shows a complete disappearance of the growth, smooth surface, and only slightly scabby condition. Oct. 22nd, 1920. Nasal cavity looks normal and patient told to report at the slightest indication of discomfort in the nose.

A letter from the patient May 15th, now 19 months since operation indicates there is no further trouble.

Contrary to the opinion of several observers, my own experience leads me to conclude that radium is much more effective in epitheliomata than in other forms of malignant growths.

In 1919 before the American Ophthalmological Society I reported two cases of epithelioma of the eyeball where exenteration of the orbit followed by the use of radium produced a complete cure up to the present, six years in one and eleven years in the other.

In 1916 the writer reported a case of epithelioma of the pharyngeal wall treated by complete excision with the electric cautery and which has remained cured up to the present date. Radium was not used, but in epitheliomata accessible for complete excision especially by the electro-cautery, results will nearly always be favorable. This has been frequently demonstrated in the removal of skin epitheliomas in the region of the face or from skin surfaces.

The cure of epitheliomata is entirely a different proposition however when they are located in a vascular region like the ethmoid or have their origin in a closed cavity like the antrum maxillary.

Thorough eradication is practically impossible, but it is in just such cases that radium does its best work.

The splendid results shown in Boston last year by Drs. Barnes and Greene in the combined use of surgery and radium in malignant growths of the head certainly leads us to be far more optimistic in our views than has heretofore been the case.

I take the liberty of presenting a bibliography of the literature bearing on the treatment of nasal epitheliomata especially in regard to the results obtained by the use of radium. No doubt this is far from being complete, but if other observers will add to this series we may begin to have more exact statistics.

Case Reports.

Adam (2) reports a case of endothelioma in which the tumor filled the right half of the nasopharynx, appearing to grow from the Eustachian orifice. Two radium applications were made on Nov. 29, 1915 and Jan. 12, 1916; 50 mg. of radium screened by 1 mgm. of gold was applied for twenty-three hours at the first treatment, and for 11 hours at the second. At the time of the report, August, 1916, the parts seemed normal. Sufficient time has not elapsed to establish a permanent cure, but the result is certainly better than could have been obtained by surgical interference. (Sonnenschein refers to this case as epithelioma.)

Botey (5) treated two cases of endonasal epithelioma with radium, with poor results. In both the growth progressed and the patients died.

Delavan (6) in his report on radium in the treatment of the growths of the upper air passages, at the Memorial Hospital, includes three tumors of the "nasal mucosa," treated by radium. Two of these had advanced recurrent lesions. (The nature of these tumors is not indicated). In the third case,—a recurrent epidermoid carcinoma of the posterior portion of the nasal septum, occluding both nasal passages, an excellent result was obtained by removing the growths with a snare and treating their bases with radium. There was no recurrence in three months.

"The difficulties of making accurate applications of radium to the nose are very great, unless the lesion is an early one and situated low down." These cases are also reported by Janeway in his book. (11)

Hill (9) reports one case of epithelioma originating in the left antrum, extending into the nasal cavity, the ethmoidal cells and nasopharynx, treated by radium: 100 mgm. of radio-bromide was inserted through a breaking-down area over the hard palate into the antrum; 50 mgm. into the same cavity by the inferior nasal route; a small tube of 20 mgm. in the ethmoidal region; a fourth tube of 50 mgm. in the nasopharynx. A 48 hour exposure was made, as the growth was fungating. The growth cleared up within a few days, but apparently had invaded the cranial cavity as the patient died "shortly afterwards" from intracranial pressure.

In general Hill says that radium is worth trying in any malignant growth of the nose and throat "which is considered hopelessly outside the range of radical excision by the knife, provided always that an adequate amount is available, and that the primary growth is accessible and not too far advanced and extensive, that the secondary adjacent growths and more remote metastases are not a contra-indication, and provided also that the general health of the patient is fairly good." If an extensive growth is treated and reacts well, a massive dose of toxins may cause not only general malaise and fever, but "a very definite toxemia."

Generally speaking, round-cell sarcomas and most endotheliomas react rapidly and consistently well to radium; spindle-celled sarcomas and fibro-sarcomas react fairly; squamous epitheliomas and carcinomas "are far more uncertain in the way they react

to radium. It may be asserted, however, that some epitheliomas in the nose, throat and gullet do react beneficially to radium, in striking contrast to those of the tongue and of the vulva."

In the case reported the author calls attention to the fact that the tumor—though an epithelioma—reacted immediately "after the manner of a round-celled sarcoma." There is usually, he says, a longer latent period in carcinoma.

Kelly (12) reports one case of epithelioma of the nasopharynx, the tumor being attached to the roof and resting on the palate, hiding the entire right posterior nares and all but the outer segment of the left posterior nares. Nasal fossae normal. It caused nasal obstruction and a severe hemorrhage. On January 27, 1915, 50 mg. of radium screened with 2 mm. of silver and covered with 2 mm. of rubber was applied for twenty-four hours. This caused ulceration of the palate and fauces for a week. On March 10th the tumor had shrunk so that the nose was free, but a small rounded mass was still present on the roof of the nasopharynx. Radium was again applied in the same dosage as before. On May 14th and June 2d there was no sign of the growth, but the site of origin was covered by an adherent crust of mucus. Underneath was an apparently healthy surface. A third radium treatment was given on June 2d. Last examination on Feb. 22, 1916. Still crusting behind the right choanal arch, but the underlying surface was healthy, and there was no sign of recurrence.

Kofler (13) reports on the treatment by radium of 3 lymphosarcoma and 11 carcinoma of the nose, mouth and throat. The results were better in the carcinoma than in the sarcoma. One of these was a basal-cell carcinoma filling the right side of the nose, originating from the region of the infundibulum. Operation of Langenbeck, followed by application of radium. Patient in good health and free from recurrence at last report. (Operation in October, 1912; report published early part of 1913, exact date not given.)

New (16) reports results from the use of radium in 211 neoplasms of the nose, throat and mouth at the Mayo Clinic.

In cases suitable for surgical treatment, radium alone is not used, he says.

Of the 211 tumors 9 were intranasal epitheliomas and 5 epithelioma of the nasopharynx. In regard to the results, New says, "It is too soon to report end results in this group."

Of the results in nasal epithelioma he says that: "Operative measures in the treatment of epithelioma of the nose are usually

of little value. Radium frequently clears up the ulceration and discharge and scars down the growth, giving the patient much relief, and sometimes accomplishing more than this." No further detail in regard to results is given.

The author's general conclusion is:

"The immediate results of the treatment of neoplasms of the nose, throat and mouth with radium, are, as a whole, very encouraging. Many patients previously operated on with a recurrence following are now treated with radium and the neoplasm disappears, giving months or years of relief, with no surgical mortality. The patients are made much more comfortable than they would be with an operation. The number of patients that will be permanently cured of a true malignancy with radium is probably very small relatively, but the number of inoperable cases that are markedly relieved and receive months or years of comfort is quite large. We do not, however, recommend the treatment by radium of any neoplasm that is surgical. In such cases the patient should have the benefit of both surgery and radium. The use of radium has entirely changed the prognosis in neoplasms of the nose, throat and mouth."

Schmiegelow (20) reports 12 cases of malignant tumors of the nose, pharynx and oral cavity treated by radium in 1918 and 1919. Three patients died; one (epithelioma of the right tonsil) from metastasis in the liver; one (cancer of the left tonsil) from recurrence in the pharynx with ulceration and hemorrhage; one (nasopharyngeal sarcoma) from septic abscess without recurrence or metastasis of the tumor. In one case (epithelioma of the soft palate and left tonsil), the tumor disappeared, but the patient suffered from a radium burn, probably due to a faulty radium tube. In another case (cancer of the tonsils) the tumor did not recur, but the glands were involved and continued painful in spite of both radium and Roentgen treatment.

In the other patients of this series, results were excellent, without recurrence in a year or over. One of these cases was an epithelioma of the nasopharynx in a woman 70 years old. The tumor was located on the posterior wall of the nasopharynx. Three radium tubes (30 mg.) of radium were applied through the nose for 24 hours on June 26, 1919; this was followed by immediate improvement, but two subsequent treatments were given as a preventive on July 31st and Oct. 11th, although the tumor

had entirely disappeared, and the tissue appeared entirely normal. Clinically the cure was complete at the time of the report (June 1920).

Schmiegelow says that Lederman and Kuznitzky (15) report one case of advanced squamous celled epithelioma of the nasopharynx which improved under Roentgen treatment, but was entirely cured by mesothorium and radium. Their original report is not available.

II. Cases Operated.

(Including only a few cases operated. See also notes with references for results with operation.)

Beck (3) includes in his report on malignant disease of the upper respiratory tract, 7 cases of intranasal carcinoma, including the accessory sinuses; 3 cases operated; 5 followed up to recent date. All died.

Dougherty (7) reports two cases of epithelioma of the frontal sinus, both operated. One patient died several weeks after the operation from purulent meningitis; the other died two months after operation from extension and ulceration of the growth.

Ferreri (8) states that epithelioma of the nasal fossae is undoubtedly rare. His table of cases shows 1 epithelioma of the antrum of Highmore, cured by operation; 1 case of rhinopharyngeal epithelioma inoperable, death; 5 cases of epithelioma of the nasal fossae and diffuse epithelioma of the nose, of which one was cured by operation, the others were inoperable; 1 epithelioma of the left maxillary sinus, not operated. One epithelioma of the roof of the mouth was treated by radium; the patient died. This is the only case of epithelioma included in the report in which radium was used.

Thomson (23) reports two cases operated, using Moure's operation. Case 1. Endothelioma of the ethmoid and antrum; Moure's operation; no recurrence in 5½ years. Case 2. Epithelioma of the left maxillary antrum; Moure's operation, no recurrence after 3½ years.

III. General Conclusions in Regard to the Value of Radium in the Treatment of Epithelioma.

Boggs (4) makes no mention of epithelioma of the nasal cavities specifically but says in regard to radium treatment of epithelioma in general:

"Primarily epithelioma is not a surgical disease, because, in order to remove all the cancerous cells, it is nearly always necessary to remove too much healthy tissue. The permanency of the end-results, in the past few years in many thousands of cases, has shown that radiation far surpasses any other method.

"Radium is the best form of radiation locally on the lesion and in regions where glandular metastases are likely to take place. Radium used over glandular centers or junctions with complete Roentgen treatment over the tributaries, is far superior to the most complete and often unnecessary dissection."

"Each year," he says, "there is a smaller percentage of surgeons removing epitheliomas. I do not mean to say that surgery is never indicated, but I believe that it is seldom, if ever, indicated in primary cases."

Janeway (10) in his 1918 article says that at the Memorial Hospital they "have been encouraged to treat a rather large number of operable cancers of the mucous membranes" with radium. "The remarkable improvement in some of the cases treated palliatively has not alone stimulated this attempt, but more especially the favorable results obtained on many early cancers in patients refusing operation, or in whom operation was contraindicated for other reasons. Two facts have been demonstrated by this experience; first, within the time limits of which we have been working, single applications were often sufficient to cause apparent complete retrogressions; and second, in the larger lesions, where this favorable result was not obtained, the lesion has become more of an operable one than it was before treatment."

The cases reported by Janeway in this article do not include any malignant growth of the nasal cavities. See report under Delavan's name in section on Case Reports.

Lannois, Sargnon and Montet (14) in their report on radium therapy in tumors in oto-rhino-laryngology, report 13 cases treated by radium. These include 6 tumors of the nose and sinuses and four tumors of the nasopharynx, but all of these were sarcoma, none epithelioma.

In general, they say, that non-epithelial tumors are much improved, often completely cured by radium, but that results are not so good in epithelioma; especially ectodermic epitheliomas containing epithelial pearls (globe corne) are very slightly influenced by radium.

Pancoast (18) reports several cases of sarcoma and carcinoma of the tonsil and one case of sarcoma of the left turbinates and antrum. No case of epithelioma of the nose or nasopharynx.

His general conclusions are:

"In the treatment of inoperable malignant growth, originating in cavities such as the mouth, throat and ear, radium therapy is an extremely valuable adjunct for the reason that it can usually be applied directly to the growth, which is more or less inaccessible to direct Roentgen-ray exposure. This alone is not sufficient, and the growth should also be attacked from every possible direction by cross-firing either by radium or by Roentgen-rays or both. Any nearby area in which metastasis is likely to occur should also be exposed.

"Sarcomatous growths, especially in the tonsillar region are more amenable to treatment than carcinomas.

"It would be best to continue treatment for some time after the apparent complete disappearance of the growth."

Sonnenschein (22) in his paper on radium in the treatment of malignant tumors of the nose and throat says little definite in regard to epithelioma of the nasal cavities as distinguished from other malignant tumors. The specific cases mentioned by him are reviewed elsewhere in this report under the authors' names.

In his table he includes 41 malignant tumors of the nose and sinuses in which radium was "the main form of treatment employed;" of these 13 were apparently cured, two were free from recurrence for one year or more, 14 were improved, 12 unimproved. Of 12 cases of malignant tumors of the nasopharynx treated by radium all were apparently cured. This table does not differentiate between carcinomas or sarcomas. Some writers, Sonneschein says, "merely speak of 'malignant disease' of certain tissues or structures so that it is impossible to differentiate in the table."

From the study of the subject presented in this article he comes to the conclusion that:

"The future of radium therapy seems very bright, particularly in reference to applications in tumors of the nose and throat, but great caution is advisable in statements regarding actual cures. It is important to watch for recurrences during a period of from two to five years.

"Radium is probably of great value before, and certainly after operations. It is very efficient in relieving pain, hemorrhage, discharge, etc., in many inoperable cases.

"Sarcomas are especially responsive to radiation; the carcinomas yield much less readily, and the squamous type of epithelioma is scarcely amenable to radium at all.

"Radium has many advantages as compared with Roentgen rays, especially for application in the nose and throat.

"The diagnosis of the malignant cases should be made by a competent laryngologist, and the radium applied either by him or in co-operation with a radiologist. Only in this way will correct statistics and reliable results be obtained, with greatest benefit to the patient and the safest guide to the profession."

Wickham and DeGrais (24) say that "the value of radium in malignant tumor of the mucous membrane is incontestable, but varies according to the region and the nature of the tumor—sarcoma being by far the most amenable to treatment."

Their cases reported do not include any malignant tumors of nasal cavities.

Barnes reports a series of malignant tumors of the nasal accessory sinus treated by operation and radium. For the operation the Moure incision is made in the cheek, and "every particle of tumor tissue, all necrotic or soft bone" removed. Where ever possible it is desirable to remove a small margin of normal tissue. A triangular flap of integument, "having its base in the upper incision and its apex at the lower limits of the antrum" is removed from the cheek, leaving a permanent opening into the operative cavity, so that any tendency to recurrence may be observed. The deformity following this is not great. The cavity is lightly packed with gauze in the center of which a radium emanation tube "of appropriate strength" is placed. The tube remains in place about two weeks, being reinserted at each dressing. As the tube loses one-sixth of its radiating strength every 24 hours, it is practically inert at the end of convalescence. Three or four later radium treatments are given at weekly intervals as a preventive measure. Marked reaction of the tissues should be avoided in these treatments.

In the series reported by the author there were six carcinomas, one small round-celled sarcoma and one fibro-sarcoma. With the exception of the last named, all were of long standing and involved both the ethmoid and the sphenoid. Three (all carcinomas) were operations for recurrences, and one (sarcoma) had had an enucleation of the eye one year before, further operation being abandoned on account of the extent of the growth. Neither sarcoma shows any sign of recurrence (14 and 26 months after

operation). Of the carcinomas, three patients have died, one has extensive recurrences, two are well with no sign recurrence 25 and 17 months after operation respectively. One of the deaths was post-operative, due to septic meningitis. The carcinoma in this case involved all the sinuses except the frontal.

The author believes that in these massive tumors of the sinuses, "radium without operation is useless." However, "thorough operation combined with immediate radiation through a wide opening in the face which for purposes of observation is allowed to remain permanently, will give, I believe, better results than we have been accustomed to consider possible."

Guichard reports two cases of epithelioma of the nasal fossa that invaded the sinuses, the orbit and, in one case the cranial cavity. No treatment is reported in one case. The other case was operated and given several X-ray treatments. The treatment was successful and the patient remained in good health. (Operation in August, 1919; report published March, 1920).

In a later article (Oct. 10, 1920), Lannois and Saignon review their work on radium treatment of tumors of the ear, throat and nose, but report no new cases. In their work they employ Dominici radium tubes; they use doses of 25 to 160 mg., left in place for 6 to 24 hours, occasionally for 36 hours, exceptionally for 48 hours.

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DISCUSSION.

Dr. Jos. C. Beck, Chicago, said that basal celled carcinoma would stay cured with excision, without radiation, because of its low malignancy. The pathological diagnosis of carcinoma or epithelioma was very important. Scirrhus growth had fewer active cells. Rapid growing cells with little stroma showed high malignancy, with certain recurrence, with or without radium. Dr. Roy mentioned cautery: Percy's cautery was often very successful. When cancer was reported cured, there was no proof, except microscopical examination of the field where the cancer was. The finding of a few cells left, did not indicate that the growth was going to recur.

Dr. Sonnenschein, Chicago, said that the question of the histology of the part of the body involved had a great bearing as regards radium therapy, which had more effect on mesoderm than ectodermic tissues. The rapidly growing embryonic cell type, or sarcoma yielded best to radium. Squamous celled epithelioma yielded least. There were three epithliomatous types: squamous; columnar ciliated; columnar non-ciliated. Excellent results were obtained on the columnar non-ciliated types.

NEW MECHANICAL PROBLEMS IN THE BRONCHOSCOPIC EXTRACTION OF FOREIGN BODIES FROM THE LUNGS AND ESOPHAGUS.

By CHEVALIER JACKSON, M. D., Philadelphia, Pa.

In the early days of bronchoscopy and esophagoscopy no thought was given to the matter of the mechanical problems of the disentanglement, disimpaction or version of foreign bodies. The whole art of endoscopy was thought to consist of introduction of the instruments. This was considered a formidable task. One text-book stated in effect that if the bronchoscope could not be introduced through the mouth in 15 minutes a tracheotomy should be done for the introduction of the bronchoscope through the neck. Today, anyone who has been taught a proper technic, and who has instruments proper for the particular patient should insert the bronchoscope in less than a minute. In the early days referred to, when the foreign body was seen, forceps were introduced, the foreign body was seized often along with tissues, and the foreign body was ruthlessly torn out at all hazards. In 1914 the author[1] called attention to the necessity of a careful study of the mechanical problems of foreign body disentanglement and removal and illustrated the general mechanical principles he had applied to the extraction of a large variety of foreign bodies. These were added to in subsequent publications[2 and 3]. Since then there have come to the Bronchoscopic Clinic so many different varieties of foreign bodies that now, with a total experience of 891 foreign bodies in the air and food passages, I am able to present additional data that will, I venture to think, place the matter on a scientific basis. By this I mean only a basis; future developments doubtless will make present attainments appear embryonic. It will, however, always hereafter be regarded as fundamental that: 1. A foreign body usually presents a mechanical problem of disengagement, disentanglement, version, method and location of seizure, et cetera, which must be worked out if low mortality and close to 100 per cent. of successes is to be attained; and, 2, conversely, grasping the first part of the foreign body seen and ruthlessly tearing it out is brutal and conscienceless, and will inevitably give a low percentage of successes and a high mortality ratio.

Movements of the Bronchi. In dealing with the problems of foreign-body extraction due consideration must be given to the bronchial movements not only because of their increasing the difficulties in certain instances; but even more because of the invaluable aid they render to the bronchoscopist who waits and watches for the advantageous phases of their movements, as herein mentioned in connection with forceps spaces. The shortening during cough is also of advantage in protruding slender bodies that are completely within small branch bronchi too small to enter as first pointed out by the author[2].

The movements of the tracheobronchial tree as I have observed them bronchoscopically, may be categorically enumerated as follows:

1. Expansion during inspiration.
2. Collapsing during expiration, almost all of the collapsing excursion being at the beginning of the expiratory phase.
3. Elongation during inspiration.
4. Shortening during expiration.
5. Excessive contraction in one, many or all diameters during cough. Sometimes in children this bechic contraction is sufficient to obliterate the bronchial lumen. In the trachea of children the posterior (membranous) wall is at times projected forward convexly into the tracheal lumen.
6. Excessive shortening during cough.
7. Displacive movements in various directions, but chiefly sidewise, caused by the movements of adjacent viscera, chiefly the heart and great vessels, but in some instances by the opposite lung.

It must be remembered that though here listed separately for clearness, two or more of the bronchial movements are often combined as elsewhere mentioned[2].

Education of the Eye and the Fingers. Nothing will take the place of work with the eye at the tube. The gauging of depth comes only slowly by dint of long practice. Manipulations to be safe must be guided by the eye, and it must be a trained eye. Coordinate manipulations of the tube and forceps must be practiced until work is as natural and familiar as with knife and fork. It is as impossible as it would be brutal to attempt to acquire this coordinate skill by practice on the living human being. Appalling mortality and failure to acquire the skill would result. Fortunately the simple rubber tube manikin[3] serves the purpose perfectly as it is always available for practice in spare moments.

Next should come practice on the cadaver and on the living dog with foreign bodies of various kinds placed in the bronchi. One is never through practicing for the general education of the eye and fingers. In addition to general practice with miscellaneous objects, when a foreign body case comes in, the endoscopist should place a duplicate of the foreign body in a rubber tube of the size of the invaded bronchus, and by manipulation with bronchoscope, or esophagoscope, as the case may be, he can familiarize himself with the appearances of the foreign body in every possible presentation and he can study and work out a solution for every possible problem. A little ingenuity will closely simulate every difficulty to be encountered in the living patient. For instance little useful practice will be afforded by removing peanut kernels loosely rattling round in a rubber tube of large diameter. Peanut kernels are not encountered that way in the living human bronchus; they are tightly bedded in the smallest bronchi they can enter. For simulating actual working conditions a half kernel should be pushed down into a rubber tube in which it is a tight fit. Then let the practitioner practice the removal as mentioned under "Peanut Kernels." If anyone will follow this plan he will come close to 100 per cent. successful removals and will have little or no mortality. I am sure that the appalling mortality that has attended bronchoscopy and esophagoscopy in inexperienced hands would never have occurred had the operators realized how little chance there is of the survival of a little child undergoing an esophagoscopy in inexperienced hands. This is true of simply the introduction of the esophagoscope. How much more forcibly it should apply to complicated removals. For instance, no one should think of attempting the endoscopic removal of a safety-pin without hundreds of hours of training of the eyes and fingers to the unusual requirements of the work. To ignore this is to trifle with human life. It is infinitely worse than to attempt removal of cataracts from a living human eye without previous practice on dead animals' eyes, which would result in blindness, not death. The removal of an open safety-pin is infinitely more difficult to learn because the cataract operation is a bimanual and binocular procedure to which all surgical work is more or less a fundamental training; whereas foreign-body endoscopy is a monocular, depth-gauging procedure surrounded by so many limitations and difficulties as to place the operator under "an indescribable stress" as Jugals so aptly stated. For a surgeon to telegraph for a bronchoscope or an esophagoscope the like of which he

never saw before and to start down the tender passages of a child in search of an open safety-pin usually ends in involuntary manslaughter, using the term literally, not in its technical sense. The author assumes part of the responsibility for these not infrequent deaths. From a mistaken sense of modesty he refrained from stating the case strongly so long as few or none had equal opportunities for experience; but now that every large medical centre has an experienced endoscopist, there is no more need of totally unexperienced men attempting esophagoscopy than for every internist to do his own appendectomies.

The Study of the Presentation is fundamental for safety and success. In foreign-body bronchoscopy as in accouchement the ruthless pulling upon any part presenting without consideration of the other parts is to court disaster. Just as the obstetrician studies out the position of the fetus and every part of its anatomy in relation to the maternal pelvis just so must the endoscopist study the position of the foreign body and the relation of its every part to the invaded bronchus or esophagus. Just as the obstetrician depends upon abdominal palpation to aid him in his interpretation of the presentation, so the endoscopist studies the roentgenogram made in two planes, the lateral and the anteroposterior, so that he may know when he looks at the endoscopically visible part of the foreign body, where the other parts lie. The ray-plates should be on a shadow-box in the operating room; and the author prefers to have the plates placed upside down for a better conception of the relations in the recumbent patient. When the presentation is not a favorable and safe one for delivery a version must be done as, for instance, when the pointed limbs of a double pointed tack[2] are turned away and the head brought into the presenting position—a cephalic version.[4]

Forceps Spaces. Fundamental in the endoscopic removal of foreign bodies is the matter of forceps spaces which is the name I have given to the spaces between the foreign body and the wall of the invaded bronchus or esophagus and into which the jaws of the forceps must go before they can grasp the foreign body. Of all the causes of failure to remove a foreign body whose location has been reached, in the cases coming to the Bronchoscopic Clinic, none is so frequently the evident cause of failure as lack of knowledge or appreciation of the fundamental importance of forceps spaces. (See illustrations A, B and C in the colored plate). Over and over again the mucosa in the neighborhood of a foreign body has evidently been traumatized in an effort to force the jaws

over the foreign body when no spaces for the entrance of the jaws existed, or futilely jamming the forceps into the mucosa in an effort to force the forceps onto a foreign body with the jaws opening sagitally ignoring the lateral forceps spaces that would have facilitated grasping had the forceps been turned so the jaws would open in the coronal plane. Had the bronchoscopist been working with both eyes and both hands in an open wound, he would make no such mistake; but being unfamiliar with the work and never having been taught the necessity of study of the forceps spaces, when he at last finds a foreign body for which he has been searching he thinks of nothing in his haste but to use the forceps. Many blind graspings and jabbings in the neighborhood of the foreign body not only fail to grasp it, but by the blood drawn from the mucosal vessels the intruder is so obscured that recognition afterward becomes impossible, and the foreign body is "lost". Had the bronchoscopist recognized his forceps spaces, or created one or two as the case required the forceps could have been accurately placed under the guidance of the eye and removal accomplished in a few seconds or minutes at the first attempt. Forceps-spaces are usually at their maximum on inspiration. They decrease immediately, not gradually, at the beginning of the expiratory phase of the respiratory cycle. In some cases both spaces exist only on inspiration, and the bronchoscopist must wait and watch, with forceps jaws close to the foreign body, for his opportunity, early in the inspiratory phase of the respiratory cycle, promptly, though gently, to insert the forceps jaws into the forceps spaces as they gape. The prompt collapse of the bronchial walls at the beginning of inspiration renders it necessary to start the insertion of the forceps jaws at the beginning of the inspiratory phase. If later, the jaws will be met and stopped by the collapsing walls. Where one space only exists, and that on inspiration, one of the hereinafter mentioned means must be used to get the foreign body into a new position in which two forceps spaces will appear either continuously or on inspiration. This respiratory opening and closing of the forceps spaces is most frequently seen in cases of peanut kernels in the bronchi; in which class of cases the forceps spaces admit aid. (See illustrations G and H in the colored plate). Where forceps spaces do not exist they may be created by four different means, used singly or in combination of one or more, involving more or less change in the presentation.

1. Displacement of one wall with the lip of the bronchoscope or esophagoscope.

2. Tilting of the foreign body with the lip of the bronchoscope.

3. Tilting of the foreign body by means of the side-curved forceps insinuated at one side and used as a hook.

4. Withdrawal of the foreign body by means of hooks of certain permissible forms, to a new position in which less swollen walls or a normally larger lumen creates forceps spaces. If withdrawal to the site of a branch bronchial orifice can be accomplished, large forceps spaces are afforded. (See Figs. 1 and 2; also illustrations A and B in the colored plate).

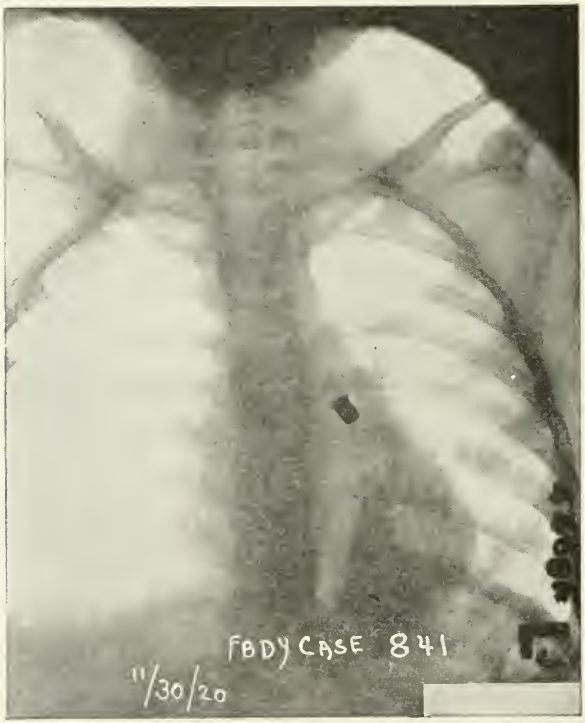


Fig. 1. Cartridge primer in left bronchus of a boy aged 7 years. The mucosa had swollen proximally until it presented the problem the solution of which is illustrated in Fig. 2.

Of all causes of failure of our predecessors to remove a coin in the esophagus in the cases coming to the Bronchoscopic Clinic, next to failure to find the coin because of overriding, the most frequent cause has been failure to establish two forceps spaces that would permit of proper approach and proper grasping, as shown in Figs. 3, 4 and 5. It seems strange that a man who would

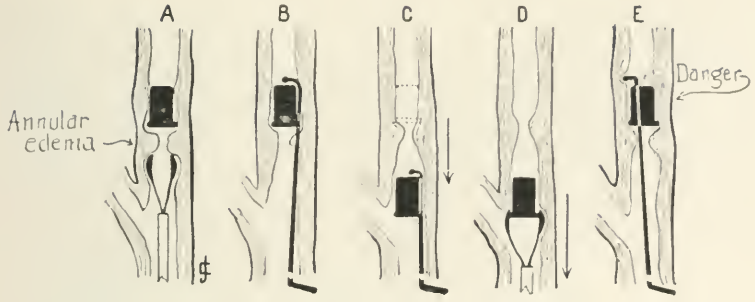


Fig. 2. How a special probe-ended hook was used to withdraw the primer cap, shown in Fig. 1, to a higher, hence wider, location in the bronchus, so forceps could be applied. Removal required 18 minutes and 33 seconds (Case No. Fbdy. 841). At A is shown the impossibility of applying forceps because of the proximal annular edema. At B the hook has been insinuated past the cap. C, the cap withdrawn above the edematous area to a widening of the bronchus where a lateral branch is given off. In this location it was easy to apply the forceps securely for the withdrawal (D). In using hooks it is necessary to be exceedingly careful to avoid pulling when the hook slips around to the wrong side (E). Pulling then might cause fatal trauma. No hook of more than a half turn (90 degrees) should be used because of the risk of getting caught in a branch bronchial orifice. Usually they are better made spirally.

Fig. 3. This coin is apparently just ready to be easily picked out with any kind of forceps. As a matter of fact a very good endoscopist, after an hour's work under ether, failed to grasp the coin for the lack of appreciation of the very simple mechanical principle illustrated in Figs. 4 and 5. Similar cases are constantly coming to the Bronchoscopic Clinic. Plate by Dr. Willis F. Manges.

naturally pick up a flat object flatwise if he were working at a bench with nippers, will try to put on the forceps edgewise in his haste to grasp a coin for which he has been, perhaps, searching a long time; yet the forceps marks on the mucosa and the statement of the unsuccessful esophagoscopist showed clearly in dozens of these cases the faults mentioned.

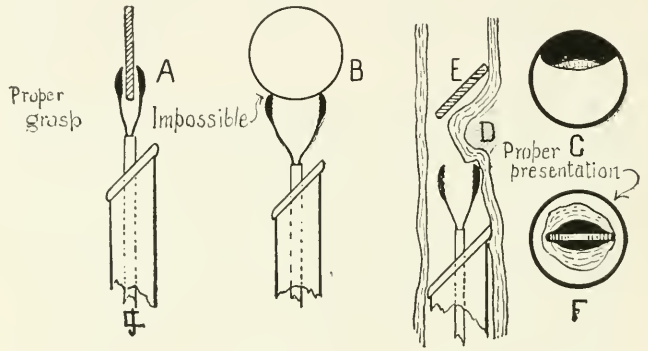


Fig. 4. The cause of many failures to seize a coin in the esophagus. Seizure should be flatwise as at A, not edgewise as at B. No attempt should be made to seize the coin in the position in which it is usually first seen, C, because one jaw of the forceps will strike the cricopharyngeal fold, as shown in cross-section at D, preventing the jaws from advancing far enough toward the coin to grasp it properly. The lip of the esophagoscopic tube-mouth should be used to obtain a proper presentation as shown at F. The same principles govern the grasping of all flat objects in the esophagus or tracheobronchial tree.

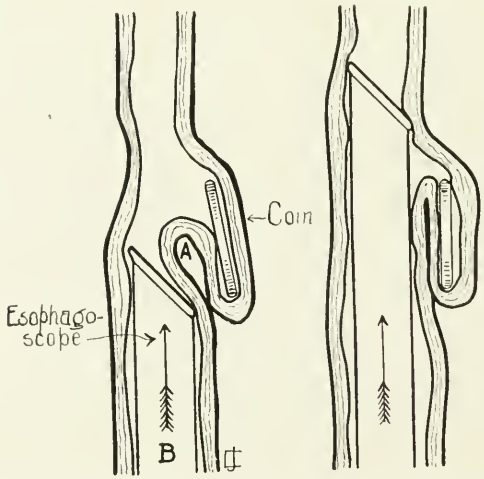


Fig. 5. How a foreign body is so frequently overridden unseen by the inexperienced esophagoscopist. The esophagoscope advancing in the direction of the dart through the normally collapsed esophagus, pushes ahead of the tube-mouth a fold, A, that obscures the view of the coin, which becomes buried in the folds alongside the advancing esophagoscope. This is most likely to occur at the cricopharyngeus, but may occur at a number of other locations.

Forceps. Endoscopic foreign-body work differs from general surgery in that instruments must be properly constructed to obtain a high percentage of successes and a low mortality. The abdominal surgeon may use a kitchen spoon as a makeshift retractor without loss of time or efficiency; but the limitations inseparable from the necessity of working through a long endoscopic

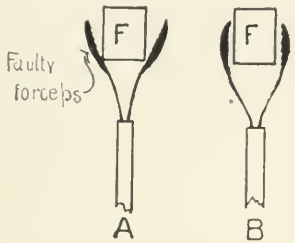


Fig. 6. Good and bad construction of forceps. The faultily constructed forceps (A) with planes of grasping surfaces divergent, not only afford an insecure grasp, but, by reason of the small area of contact, really only pivotal, permit the foreign body (F) to swing sidewise at every touch of the natural passages, which swinging is sure to result in loosening the foreign body from the grasp of the forceps. Proper forceps (B) have the planes of the grasping surfaces parallel.

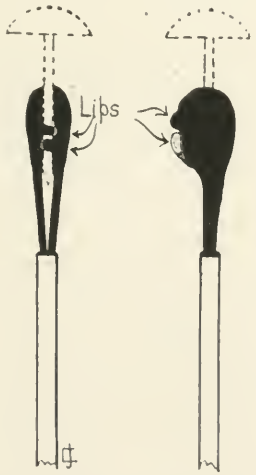


Fig. 7. Side and top views of the Tucker forceps. The small lips added to one side of the side-curved forceps by Dr. Gabriel Tucker prevent the slipping out of the shaft of a foreign body, such as a tack or a pin, or a safety pin, during the turning out of the point from the mucosa and the bringing of the point into the tube-mouth. This forceps adds to the Jackson method of safety pin removal a certainty which makes this method an ideal one. The Tucker forceps are also excellent for the disimpaction and removal of tacks, pins and nails.

tube of small diameter are such that the slightest departure from the required design may make all the difference between success

and failure, indeed between life and death. For instance, the slight departure from the shape of the jaws of the forceps shown in Fig. 6 made the forceps worthless. The endoscopist who failed to hold his foreign body did not realize that though they had been foisted upon him as of my design they were faulty copies of the forceps that have stood my every test for twenty years. When properly made they convey an exquisitely delicate sense of touch. For general purposes the side-curved forceps advocated by me in the early days of bronchoscopy still remain the standby for the majority of the cases, with the plain forceps and the rotation forceps next in usefulness. A number of special forceps for special

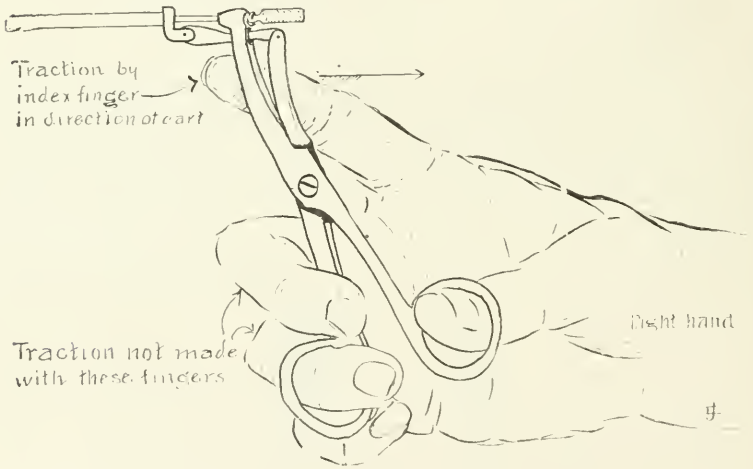


Fig. 8. Proper manner of holding forceps.

purposes have been devised. Of my own devices there is no need of mention here. Spencer's forceps hold screws well. My assistant, Dr. Tucker, has added a lip (Fig. 7) to the side-curved forceps which overcomes one of the greatest difficulties in turning out the point of pins, safety-pins, needles, tacks and similar objects when the point is buried in the mucosa. The lip is too short to inflict serious trauma from light grasping. Of course, if traction is made upon tissues serious or fatal trauma may be inflicted with any kind of forceps. Care and gentleness are necessary in the use of any kind of bronchoscopic or esophagoscopic instruments.

As mentioned under "Use of Forceps" heavy construction destroys all delicacy of touch. Great strength is not necessary; but the temper of the steel must be such that it will bend before it will break.

A Locking Clamp for Forceps. In a few mechanical problems it may seem advantageous to lock the forceps on to the foreign body.

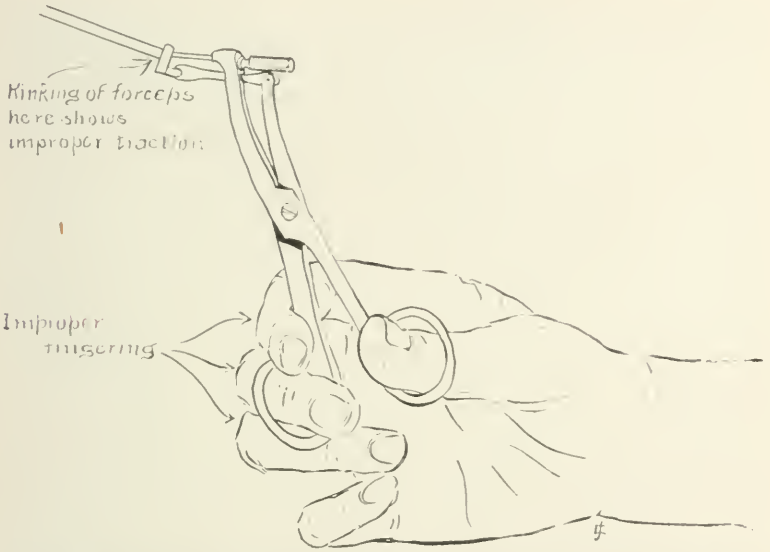


Fig. 9. Improper use of forceps. Forceps can be so constructed as to do away with springing upward here shown; but the delicacy of touch essential to safe and efficient work would be thus destroyed.

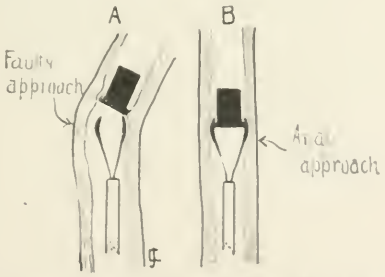


Fig. 10. If the axis of approach is at an angle (A) instead of vertical to the presenting plane (B) of the foreign body, the intruder will be pushed down without either blade having had any chance to pass outside of the presenting part of the foreign body. The faulty angle of the approach (A) will often be encountered unless the head of the patient is moved in the proper direction to obtain an axial presentation of the bronchial lumen and an axial approach (B) to the foreign body.

For this purpose a clamp is made that fullfils all requirements. As it is rarely needed it seems best to have it as a separate

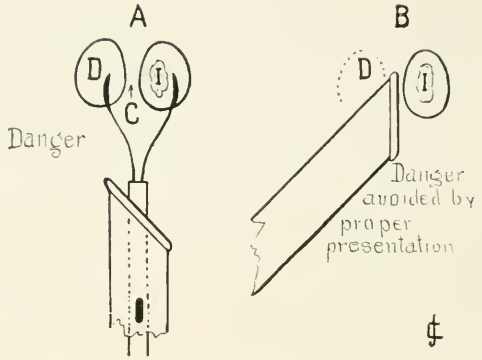


Fig. 11. How to avoid including the dividing spur in the grasp of the forceps. If in an attempt to grasp the foreign body, I, the forceps are allowed to expand with the bronchoscope exposing both bronchial orifices as at A, the spur is apt to be caught, giving an insecure hold, and dangerous trauma is almost certain to be inflicted (See illustration D in the colored plate). By moving the head to the left the foreign body is presented centrally and the spur, C, is out of the way to the left, the bronchial orifice, D, passing out of the endoscopic field of vision and out of harm's way.

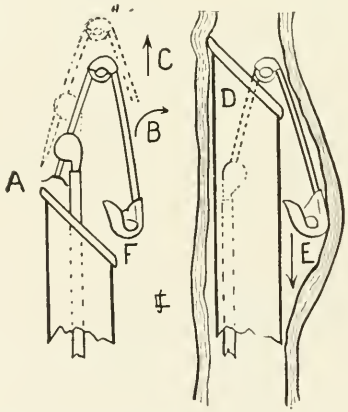


Fig. 12. Author's method of dealing with the problem of the safety pin lodged open and point upward. The point of the pin is always sunken into the mucosa as shown at A. The pointed branch of the pin is seized with the forceps, which are then rotated about 90 degrees, so as to get under and turn out the point as the pin is pushed downward with the forceps. This double movement is indicated by the darts B and C. The tube is then pushed downward over the pointed branch of the pin until this branch is completely within the tube (D). The pin is then withdrawn, the keeper sliding harmlessly up outside the tube (E). The keeper really lies closer than shown in the drawing, which is made schematically to emphasize the fact that the keeper is outside. Care to maintain the greater plane of the keeper coronally is necessary at the cricoid in the case of the esophagus, or sagitally at the glottis in case of the tracheobronchial tree.

attachment to avoid encumbering the forceps during the use in the hundreds of cases in which it is not needed.

The Use of Forceps requires study and, especially, practice so that their handling and coordination with the tubal manipulations becomes as natural and automatic as the use of knife and fork. The forceps are, mechanically speaking, a prolongation of the fin-

Fig. 13. This illustration shows the advantage of turning the roentgenogram upside down for esophagoscopy and bronchoscopy in the recumbent position. This contributes to a proper conception at bronchoscopy of where the unseen parts of a foreign body are in relation to the visible parts. The irregular double hook-shaped piece of metal was in the esophagus of a girl aged three years. (Case No. Fbdy. 785). Both hook-shaped ends were buried in the esophageal wall, requiring special manipulations for the solution of disentanglement and safe removal. By comparing the schema, Fig. 11, it is seen that placing the roentgenogram upside down all the relations correspond to those encountered at endoscopy.

gers. Their necessarily great length makes their use somewhat in the nature of walking on stilts. Special practice is necessary to

acquire perfect control. This practice should be first on the rubber tube manikin and this practice should never be abandoned. It is what scales and exercises are to the musician.

The forceps should be held as in Fig. 8. This placing of the fingers can be memorized by the formula: "The ring finger in the ring." This position leaves the index finger free for pushing (always gently) on the stylet. When traction is necessary it is also made with the index finger in a mechanically correct manner as shown in Fig 8. It is for this use of the index finger that this forceps was designed. It gives a delicacy of touch transmitted

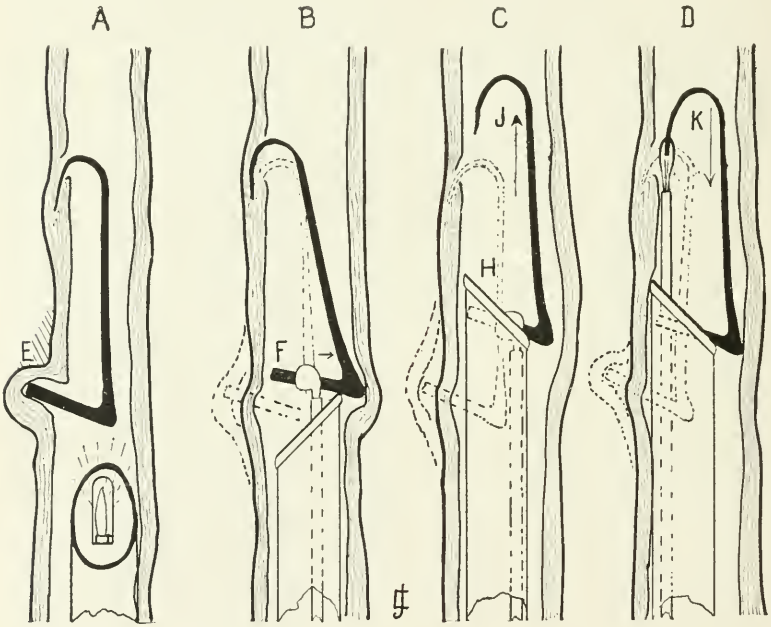


Fig. 14. Schematic illustration of the problem of the double opposed hooks presented in the case illustrated in Fig. 13. The distal hook had penetrated the mucosa, while the proximal hook, E, was buried and locked in a fold above the cricopharyngeus (E) over which it was hooked. The removal was accomplished in six stages:

1—Manipulation of the proximal hook strongly in the direction of the dart, F.

2—Guiding the proximal hook down through the cricopharyngeal narrowing, E, so as to disengage the distal hook, J.

3—Pushing the esophagoscope downward so as to repress the cricopharyngeal fold, E.

4—Placing the lip of the tube-mouth under the proximal hook, H, to prevent its catching during withdrawal.

5—Seizing the point of the distal hook, K, with forceps to prevent the point catching during withdrawal.

6—Withdrawal of the foreign body, the forceps and esophagoscope together as one piece.

Time required: 9 minutes and 37 seconds. No anesthesia was used and there was no trauma and no reaction. (Case No. Fbdy. 785).

through the most sensitive tactile member with which man is endowed. Forceps designed to do away with the springing upward shown in Fig. 9 are like making a violin bow of cast iron so it will not yield. The parts of a forceps outside the tube can be made as heavy as desired and opening springs may be added; but when these things are done all delicacy of touch is destroyed.

The Axis of Approach of Forceps is of the utmost importance and especially so in case of foreign bodies with a more or less flat face occluding most of the area of cross section of the bronchus. As will be understood from Fig. 10, a wrong angle of approach may make all the difference between the removal in a few minutes on the one hand and on the other, not only failure to seize the foreign body but pushing it down tightly into a position in the bronchus from which removal may be exceedingly difficult. Before

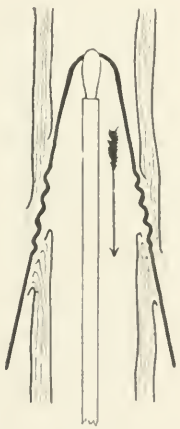


Fig. 15. Schema showing how fatal trauma can be and has been inflicted by injudicious traction, in the direction of the dart, on a hair pin lodged points—upward in the esophagus.

insertion of the forceps the axis of the bronchoscope should always be brought into the position in which its axis corresponds to that of the invaded bronchus. If in doing this one edge of the field of view is obscured by the projection of the angle of the bronchial wall, the obtruding angle may be repressed with the lip of the bronchoscope. Usually all that is required is the rotation of the bronchoscope so as to bring the lip around to the obtruding sector. In the esophagus axis of approach may increase those difficulties of proper grasp due to faulty presentation and lack forceps spaces, as illustrated in Figs 4 and 5.

Avoidance of Inclusion of Tissue in the grasp of the forceps is very important for three reasons. 1. Serious or fatal trauma may be inflicted by the laceration of blood vessels. 2. Laceration of the bronchial wall may allow air and infective material to leak into the pleura producing a serious complication, or into the mediastinum, causing death. 3. Tissue between the forceps and the foreign body renders the grasp insecure. For these three reasons pulling upon a foreign body when tissue is included with the foreign body in the grasp of the forceps usually ends not only in failure to remove the intruder, but also in serious or fatal illness of the patient. (See Fig. 11; also D in the colored plate).

Safety-pins. An open safety pin lodged point upward in the

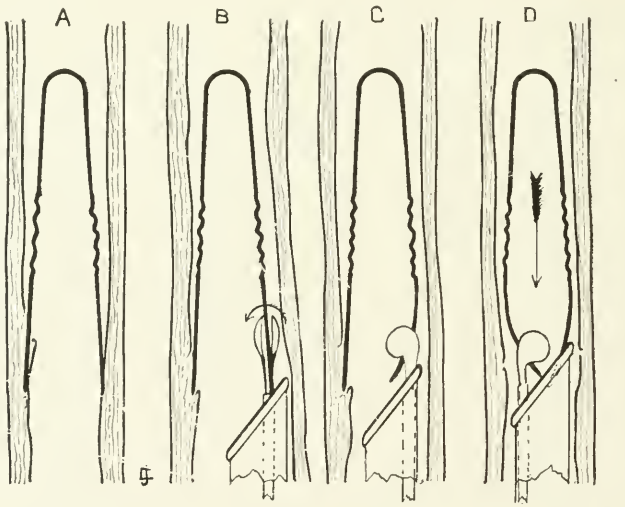


Fig. 16. Schema showing how the danger shown in Fig. 15 was avoided by a carefully worked out solution of the mechanical problems involved. The points of an object like this have either penetrated the mucosa or penetration is imminent. First one point is turned with side-curved forceps (B, C); then the esophagoscope (or bronchoscope) is pushed down so that the turned point rests on the lips of the tube-mouth while the other point is turned in. Thus protected, traction in the direction of the dart is safe. (Case No. Fbdy. 837).

hypopharynx is readily rotated with alligator forceps so that the point is in the spatular tip of the laryngoscope which thus protects the tissues from laceration. The same method is ideal also in cases of laryngeally lodged safety-pins. In cases of deeper lodgement in either the esophagus or tracheobronchial tree the pin may be closed or removed by the author's point protected method[2] by which

the pointed branch of the pin is brought as far as it will come into the tube-mouth. The pin, forceps and tube are then all brought out together, the keeper branch sliding upward harmlessly on the outside of the tube. Fig. 12, illustrates the method more clearly than the original illustration. This method will be greatly facilitated by the lips added to the side-curved forceps (Fig. 7). The chief difficulty encountered in the plan of getting the pointed branch into the tube-mouth was the tendency of the spring of the safety-pin to throw the pointed branch out of the grasp of the forceps. This the lips of Tucker's forceps prevent. These forceps make of this point-protected method the least difficult of all the plans of dealing with the open safety-pin. Success and a reasonable degree of safety with any method of extraction of safety-

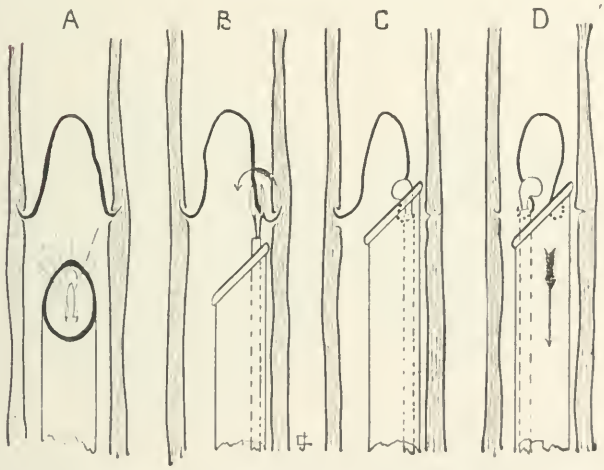


Fig. 17. Schematic illustration of the method of disentangling a sharp pointed, double, hook-shaped wire from an egg-beater that had lodged in the esophagus of a woman aged 57 years, while eating custard pie. (Case No. Fbdy. 434) The two hook-shaped sharp ends were buried in the mucosa (A). At B and C are shown the author's "outward rotation method" of disembedding buried points of any kind. In this case the wire being annealed the points were easily bent, one at a time, inward toward each other to get them into the tube-mouth for safe traction (D). The solution of the problem would be the same if the foreign body had lodged with the hooked ends downward. The method used in this early case has since been used many times in the Bronchoscopic Clinic for the removal of hair pins, bent wire, etc.

pins lodged point upward requires long preliminary practice on the rubber tube.

Rules for Roentgenographic Examination of Safety-pin Cases. In dealing endoscopically with an open safety-pin, lodged point upward, the six most essential things to know beforehand are:

1. The size of the pin.
2. The greatest spread from the point to the keeper.
3. The exact plane of this greatest spread.
4. The direction of the point.
5. The precise location of the point, the keeper and the spring.
6. The degree to which each of the two branches of the pin deviates from the vertical axis of the patient's thorax.
7. Bends, breaks, kinks or other imperfections of the pin.

More failures safely to remove safety-pins have resulted from lack of a properly preconceived mental conception of all these data as to the particular case than from any other one cause. All of these data can be supplied by the Roentgenologist. To get these data one plate at least should be free from foreshortening. With these data and a duplicate of the pin the trained bronchoscopist can in a few hours with his bronchoscope or esophagoscope and a bit of

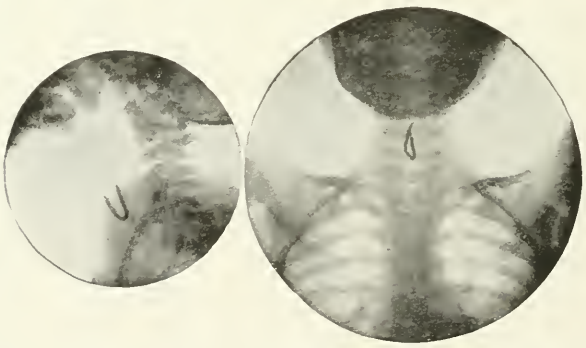


Fig. 18. Roentgenograms, anteroposterior and lateral, showing staple in the sub-glottic trachea of a girl aged 4 years. (Case No. Fbdy. 825). Removed laryngoscopically through the mouth by cephalic version, in one minute and thirty-five seconds, without anesthesia, general or local. The illustration also shows the necessity of the ray study in two planes. The lateral view conveys no idea of the complicating curves and divergent points that it was necessary to know in order to accomplish the version.

rubber tubing work out the problem in such a way as to make him feel sure of safety and success in dealing later with the patient. The working plates in the operating room should include a lateral, an anteroposterior and one free from foreshortening.

Irregular Metallic Objects. The varieties of these are numerous; but the general principles of the solution of the problems of extraction are the same. A careful ray-study in all planes is made to ascertain the dimensions of the foreign body and the planes in which the greatest and least dimensions lie. Then a study is made

to determine the position of points, rough places, hooks, angles or any other potentially traumatising characters of the foreign body. A plan is next worked out, first in theory, then on the rubber-tube manikin, by which hooks are disengaged, points guarded, rough places turned or held away, during withdrawal so as to avoid trauma. A good illustration of the method of working out these various problems, or combinations of problems is shown in Figs. 13 and 14, and will be understood from reading the legend.

Hair-pins and Bent Wires. These cases are similar to the staple in that the points become buried (Fig. 15 and Fig. 16) but they differ in that the wire is of smaller gauge and is annealed, hence is easily bent. The fence staples are of rigid wire that cannot be bent or cut by any instrument that can be used through a bronchoscope.

The wire from an egg-beater was quickly and safely removed by the method shown in Fig. 17.

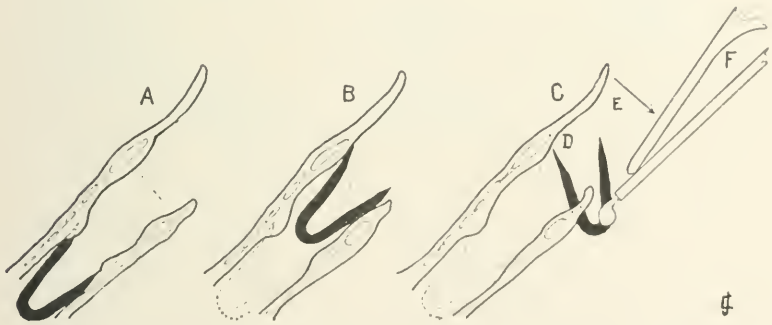


Fig. 19. Illustrating the solution of the problem of the staple, with buried points, in the case illustrated in Fig. 18, by posterior version (C). The turning was done after working the staple upward, one point at a time (B), always guarding the advancing point. The trailing point (D) has no tendency to puncture. The laryngoscope (F) is exerting pressure (E) on the forceps in a posterior direction to complete the version.

The hair-pins were removed by the method illustrated in Fig. 16. Being of stiffer wire a forceps of different shape facilitated the bending of the points.

Fence Staples. The surpassing difficulty in dealing endoscopically with these objects when encountered points upward, as they usually are, arises from their construction. In order to be driven into wood the points are made very sharp and the steel is very rigid. The points are spread and they rip in upon the slightest effort at traction. The wire cannot be cut or bent with any instrument slender enough to go through a bronchoscope. The method

of cephalic version by which the author first solved the exceedingly difficult problem presented by these foreign bodies when they are lodged point upward[4] has proven entirely satisfactory in seven subsequent cases, in all of which the staple was removed without mortality. The essential thing to remember in turning or otherwise manipulating these objects is that the trailing point does no harm; whereas the advancing point will rip in unless it is watched and the tissues are safely guarded. In a recent case (Fbdy. No. 825) of a staple in the trachea of a girl, aged 4 years, the points were found buried in the swollen subglottic tissues below the anterior and posterior commissures respectively, the greater plane of the staple being sagittaly lodged (Fig. 18). The posterior point was

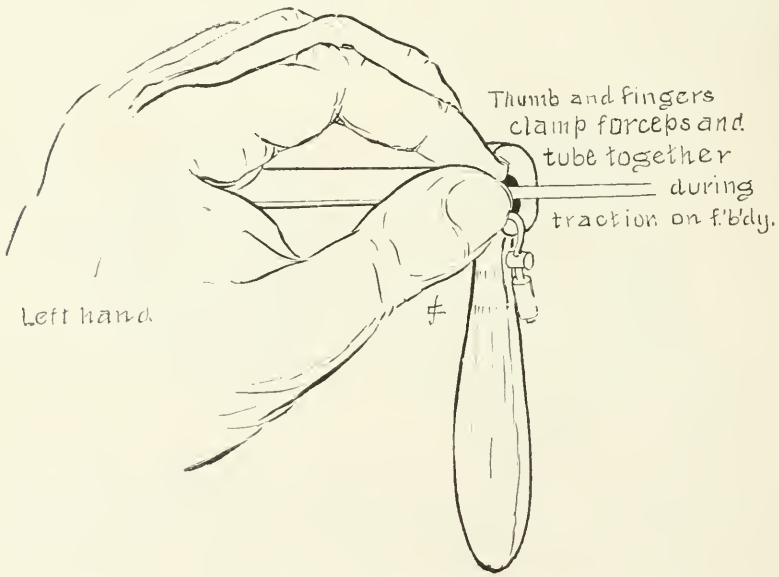


Fig. 20. In order to avoid the lagging behind of the foreign body (See Fig. 21) and to insure the movement together of the foreign body, the forceps and the bronchoscope,—all as one piece, the left hand should be used as here shown to clamp the cannula of the forceps against the proximal tube-mouth while traction is being made. The left hand should make all the traction, the right hand simply moving along passively while making the necessary degree of compression on the forceps handles. This method applies to any and all foreign bodies that are too large to be withdrawn through the tube.

readily seized and advanced up out of the larynx, the anterior point being caused to trail downward as the curved head was brought upward. The head was then gently forced posteriorly against the soft-tissue wall which yielded enough to permit version. (Fig. 19). For success with staples it is essential to have beforehand a mental

conception of the staple in all its relations. For these the ray study should be made to determine:

1. The exact length of the staple free from foreshortening.
2. The extent of the spread of the staple from point to point.
3. The plane of the greatest spread.
4. The location of the staple.
5. The degree of deviation of each of the two branches of the staple from the vertical.
6. The form, size and axis of the bronchi in the neighborhood, as shown in stereoscopic plates. If necessary the author's method of lung-mapping by the insufflation of bismuth may be used to increase the visibility of the bronchi.[6]

Peanut Kernels and similar friable substances such as beans and

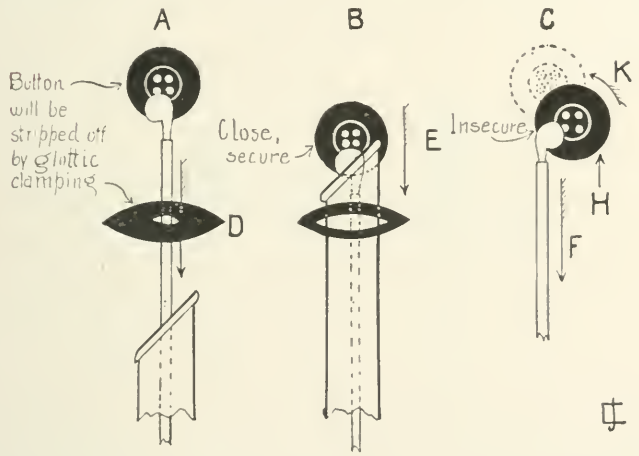


Fig. 21. Illustrating the necessity of keeping the foreign body close to the tube-mouth during withdrawal so as to emerge with the tube (B). If allowed to trail, as shown at A, it will be stripped off the forceps by the glottis (D) clamping tightly around the stem of the forceps. This applies to the endoscopic removal of all foreign bodies too large to be brought out through the tube. In esophageal work the cricopharyngeus will strip off the foreign body in the same way as the glottis does at bronchoscopy. Therefore, (D), in the schema above may be taken to mean either glottic or cricopharyngeal clamping. At (C) is shown the fault of the one-sided grasp of any foreign body in endoscopic removal. When traction is made in the direction of the dart (F) the resistance of any tissue encountered (H) by the sidewise projecting portion of the button will cause the button to be rotated in the direction K, inevitably loosening it from the grasp of the forceps. (See also Fig. 33).

maize require great delicacy of touch. So exacting is this requirement that it is my rule when a series of cases at a clinic includes a peanut case, it is always taken first in order that delicacy may not be obtunded by any preceding work. Peanut kernels are especially friable, the friability varying with the degree of roasting and to a

less extent with the degree of maceration. To crush a peanut kernel in the bronchus of a child is apt to cause multiple abscesses from the scattered aspiration of minute fragments that cannot afterward be found. This is a disaster to avoid which the utmost caution should be taken, while endeavoring to hold the peanut kernel sufficiently securely to prevent its being stripped off at the glottis. For these friable substances I have used for years a fenestrated forceps; but have recently added to my equipment for this purpose an extremely delicate model of the plain grasping forceps. The jaws are very thin as befits the small forceps spaces usually available in these cases, and a very soft spring permits of the utmost delicacy of touch. Great strength is not necessary and these forceps are carefully kept for this particularly delicate work in which they have given the utmost satisfaction. Like all other forceps they should have a covering-clamp slipped on over the jaws to

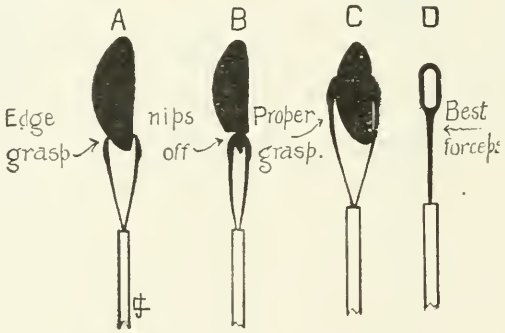


Fig. 22. Illustrating the right and wrong ways of grasping peanut kernels and all other friable substances. If the forceps are applied close to the presenting edge a fragment of the edge will be nipped off (B). With proper forceps and a gentle hand the peanut kernel will not be crushed if grasped as shown at C. The author's special peanut forceps (D) have proven very satisfactory. The long soft spring of the jaws as well as the fenstra and the springless handle all contribute to gentleness of grasp with sufficient holding power.

keep them closed and protected when not in use so that the jaws will not get bent backward. All forceps should be well oiled in their cannulae before putting away. Reliability in instruments depends largely upon their care. With the very delicate forceps needed to feel a peanut kernel a well cared for instrument may make all the difference between sending the baby home well in a few days and sending him home in a box. With a delicate forceps well oiled and working smoothly in his possession the man who expects to be successful in removing peanut kernels without crushing them should

crush a few quarts of peanut kernels to acquire the sense of tactile differentiation between the degree of forceps-pressure necessary securely to hold a peanut kernel during its withdrawal through the glottis and the degree of pressure that will crush it. This is a purely manual thing to be acquired only by feeling the peanuts crush and then feeling others against the tube-mouth while being withdrawn. Knowledge of how to do it is not enough. The problem is simulated for practice by inserting half of a peanut kernel in a piece of rubber tubing so small that it fits tightly. Then working through the infant size bronchoscope the forceps spaces are found, the forceps placed, and the peanut is withdrawn until it is felt to meet the distal tube-mouth. Then the forceps are clamped against the side wall of the proximal tube-mouth with the fingers (Fig. 20) so as to fix the tube, foreign body and forceps together as one piece during withdrawal. This method minimizes the likeli-

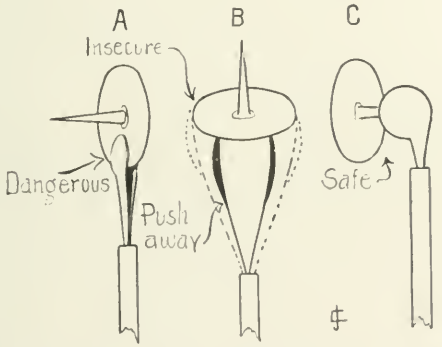


Fig. 23. The problem of the thumb tack. If grasped as shown at A, serious, and if in the esophagus, fatal trauma will be inflicted during removal. If the flat face of the head presents, as at B, the attempt to apply the forceps will push the intruder into a lower and more difficult position; and even if the forceps were gotten over the periphery of the disk-like head as shown by the dotted lines, the hold would be very insecure. If the stem of the tack is grasped as at C, the hold will be secure and, most important, the point will be covered so as to protect the tissues from trauma. All other presentations should be converted into this one (C) by version with the forceps and the lip of the tube-mouth used coordinately.

hood of having the foreign body stripped off at the glottis as shown in Fig. 21. Much practice is necessary to execute this maneuver with soft friable bodies like peanut kernals. If pulled too strongly against the tube-mouth they will be stripped off, or worse, crushed by the tube-mouth, forcing the forceps shut. One great fault I find in pupil physicians at the Bronchoscopic Clinic is the nipping off of the peanut kernel by an insufficient grasp. If the forceps close on the minoraxis of the peanut kernel, crushing is much less likely than if the edge only is grasped (Fig. 22).

Grains of maize usually present the germ end, the center of which is soft. If this germ is grasped it will come away leaving the "mouse-gnawed" grain behind. To prevent this the grain should be grasped as shown at C, Fig. 22.

Tacks, pins, needles and similar pointed objects present problems the solution of which I described years ago[1]. These solutions have stood the test of many cases and have never failed to yield results. One great aid in the execution of these manipulations will be the new Tucker modification of the side-curved forceps, Fig. 7. The little lips projecting down prevent the shaft from slipping out of the grasp of the forceps.

Thumb Tacks present a different problem from other tacks. They also present a good illustration of how a foreign body potentially dangerous may be safely and easily removed. The dangerous and the safe ways are illustrated in Fig. 23.

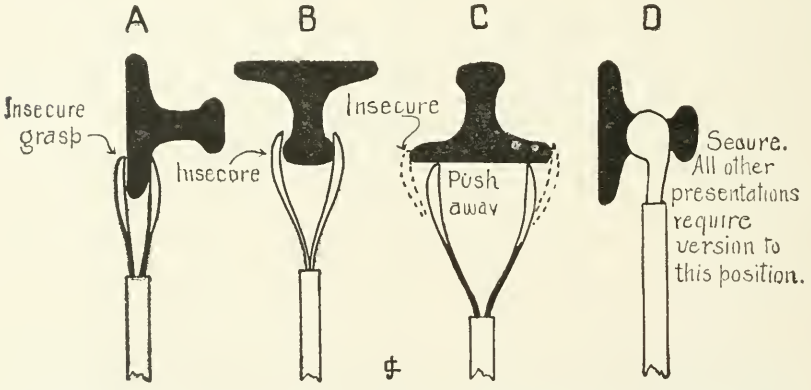


Fig. 24. The various unfavorable presentations of the collar button and how they are converted into favorable presentations by version. At A is shown a very insecure hold; the collar button is certain to be stripped off at the glottis. At B is shown another insecure hold. In the presentation, C, it is almost impossible to grasp the collar button and the attempt is likely to push the button into a deeper and more difficult position. Even if the forceps were expanded to the position of the dotted lines the hold would be very insecure because of the tendency to tilt. At D is shown a very secure hold. All other presentations should be converted into this one by manipulation with hooks, or preferably side curved forceps, and tube-mouth worked co-ordinately as knife and fork. The position, D, presents least resistance in withdrawal because both base and head each present a somewhat conoidal shape. In the position, B, the base will anchor in the esophageal folds of a child and traction will inflict fatal trauma.

Collar buttons. The many different positions in which a collar button can present itself makes it an ideal object for practice on the rubber tube. It is a typical example on the value of version in converting an unfavorable presentation into a favorable one for grasping and removal, as illustrated in Fig. 24.

Hard, Smooth Conoidal Bodies are best dealt with as shown in Figs. 25 and 26.

Toy Jacks are managed as shown in Figs. 27 and 28.

The Upper-lobe Bronchi are rarely invaded, but in their proximal portions, a foreign body is readily dealt with. When the ascending branches are invaded the difficulties of work are very great, as shown in Figs. 29, 30 and 31; but they have been to a certain extent overcome by methods developed in collaboration with Dr. Willis F. Manges.

Very Large Foreign Bodies in the esophagus present difficulties

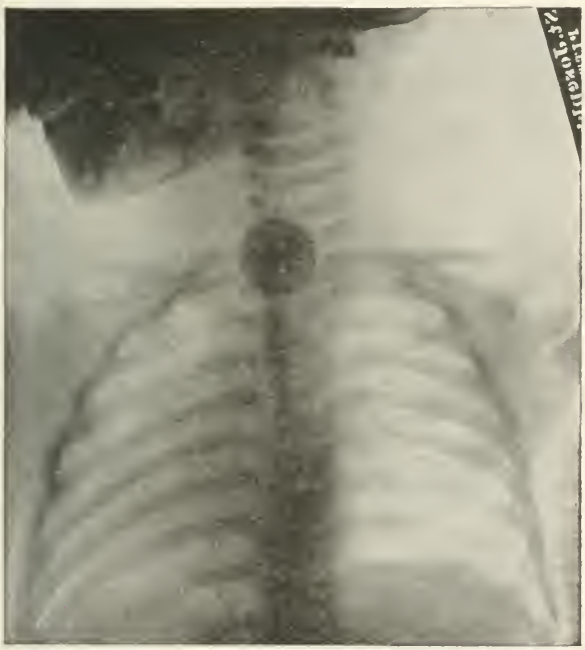


Fig. 25. Most buttons, occurring as foreign bodies today, being made of casein, do not show. This one, of a denser composition, pearl shell, shows clearly. The mechanical problems of removal of buttons are illustrated in Figs. 21 and 26.

that have defeated many esophagoscopists, some of whom have gone so far as to say that external esophagotomy with its relatively high mortality, is justifiable. This I feel sure is a mistake, apart from the fact that it, in any event, could only be applied to foreign bodies high in the esophagus. Formerly I thought it necessary in cases of esophagoscopy for very large and sharp foreign bodies to relax the patient by ether anesthesia to prevent trauma by the clamping

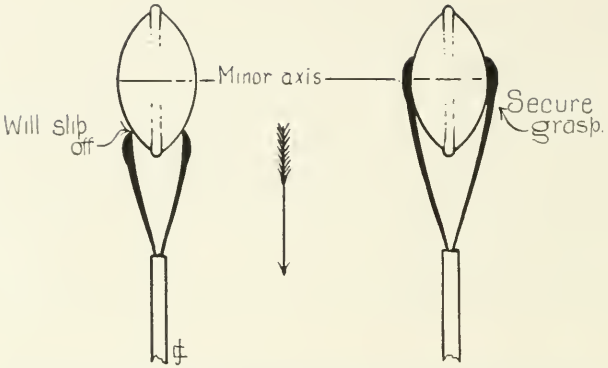


Fig. 26. The problem of the thick, hard, smooth-surfaced foreign body of conoidal cross-section, illustrated in this instance by an ellipsoidal button. If grasped near the vertex, the forceps will slip off as soon as traction is made in the direction of the dart. To get a secure grasp, the forceps jaws must be placed beyond the minor axis of the ellipsoid, or base of the conoid, as the case may be. With spheroidal bodies, the jaws should go beyond the equator.

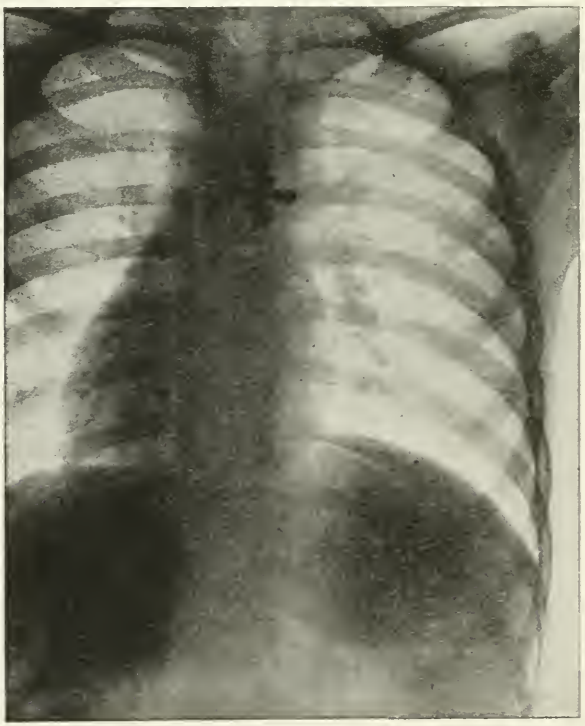


Fig. 27. Toy jack in the esophagus. Removal presented the problem the solution of which is illustrated in Fig. 28.

of the foreign body by the esophageal musculature. This I have found to be rendered quite unnecessary by the hereinafter mentioned manipulation. Because of the development of this technic also, I have never yet had to resort to morcellation and fragmentary removal of any foreign body because of its size, though preparations for so doing have always been made. If anyone should desire to cut a foreign body it might be well to use the bouginage esophagoscope because the increased lumen obtained by putting both the drainage and the light canals outside of the wall of the tube permits the use of large, heavy shears. Such procedure as morcellation introduces special dangers to the patient. I have always, so far, found that any foreign body that has gone down the esophagus could be brought back the same way provided certain requirements are fulfilled. To have seized the large intruder with powerful forceps and dragged it out by main strength would undoubtedly

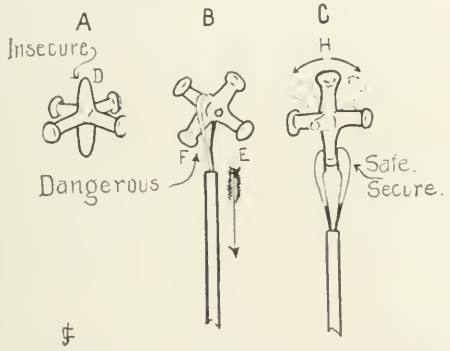


Fig. 28. The problem of the toy jack in the esophagus. The plain points, D, afford a very insecure grasp. The grasp with rotation forceps, B, is very secure, but in this grasp the points E and F have a hook-like action similar to a Graefe basket and are sure to injure the esophageal wall by catching in a fold. The most secure grasp and the one that should always be obtained, by version if necessary, is with a cupped forceps applied to one of the ball points. This grasp permits wobbling (H), which permits the other points of the jack to free themselves from the fold encountered during withdrawal in direction of the dart. In some cases assistance by rotation with the forceps is needed to free the points.

have been fatal in many cases. Five precautions are necessary for safety and success in the author's method of esophagoscopic removal of very large foreign bodies by rotation and tubal manipulations:

1. Very careful ray preliminary study is necessary to determine the location of any sharp corners or edges, any concavities, hooks, or other possible characters that might impede removal or cause trauma, so that such potentially traumatic factors can be eliminated by version or otherwise.

2. The largest possible esophagoscope must be used so as to hold the esophageal walls well spread apart during withdrawal. The esophagoscope must have the regular slanted end, so as to afford the advantage of the lip in the tubal manipulation of the folds.

3. The foreign body must be brought up in the position of least resistance, doing a partial or complete version if necessary

Fig. 29. Roentgenogram showing a coil spring hook reaching "around the corner" into the outermost ascending branch of the upper lobe bronchus of a patient. The hook went beyond the foreign body because this particular coil-spring was of too long a radius of curvature. This plate was made by Willis F. Manges, whose aid in the development of upper-lobe-bronchial work is gratefully acknowledged by the author.

for the purpose. Rotation forceps are usually the most serviceable instruments for this purpose.

4. The foreign body must be kept close up to the tube-mouth during withdrawal for three purposes: (a) To keep the foreign body in the space of widely separated walls in the wake of the tube-mouth; (b) To keep the foreign body in view all the way up so as to enable the esophagoscopist to carry out tubal manipulation of the collapsing folds; (c) To minimize the clamping of the intruder by the collapsing folds. (Figs. 32 and 33).

5. A close watch for collapsing walls and clamping folds must be maintained and these must be controlled by manipulation with the lip of the slanted tube-mouth.

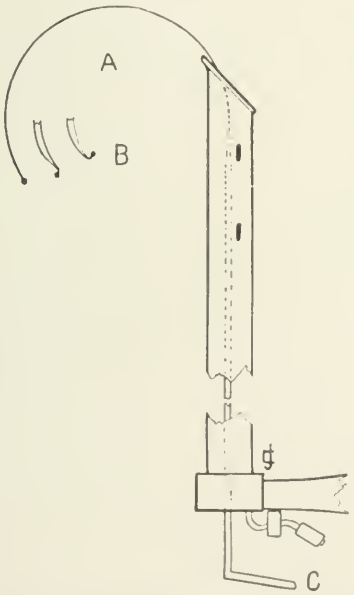


Fig. 30 Coil-spring hooks for reaching "around the corner" into the ascending branches of the upper-lobe bronchus. They are straightened in their passage through the bronchoscope, resuming their curve after emergence. The degree to which this emergence is permitted regulates the distance of entrance into the upper-lobe and, to some extent, the radius of curvature; though hooks of different spring radii are provided. The hook, proper, at the extremity (B) does not exceed a right angle in its bent position. Hooks are made in various directions, but the two illustrated (B) have the advantage that, if caught, they can be disengaged by manipulation of the handle (C).

These methods have enabled me to remove esophageally lodged foreign bodies in 238 consecutive cases without resort to external esophagotomy in any case.

Magnetic Extraction of Foreign Bodies. One of the most frequently asked questions is in regard to the usefulness of magnets in cases of foreign bodies in the lungs. There have been no developments since our report.[7] The limitations arise from the small size of the foreign bodies and the fact that they are not free to move. The smaller the foreign body the less the magnetic attraction. If an iron or steel foreign body were the size of a sledge hammer it could be pulled out through the chest wall. The only case in which a magnet could possibly be desirable would be that of a tiny iron

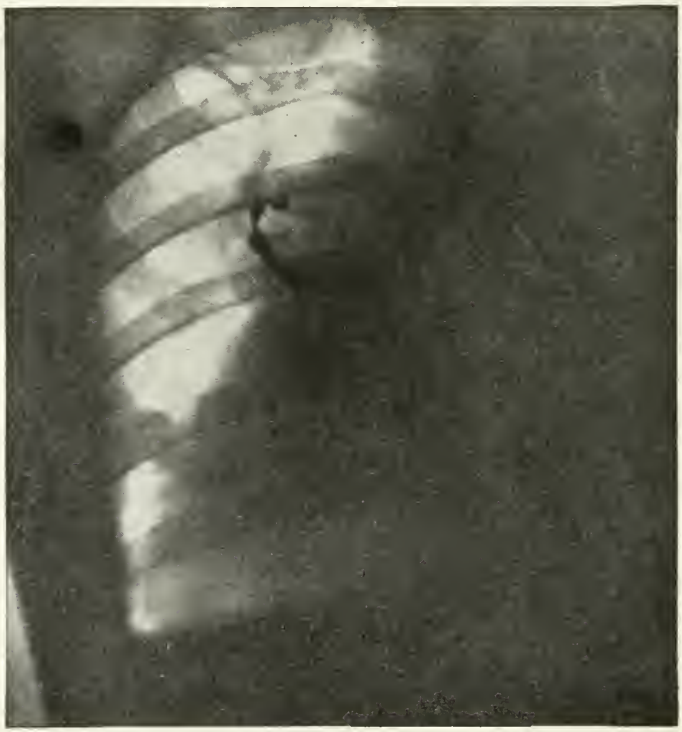


Fig. 31. Roentgenogram showing the spiral, upper lobe bronchus forceps extending around 180 degrees in an ascending branch of the upper-lobe bronchus. Though apparently in contact with the foreign body the forceps are in a bronchial branch about 2 cm. anterior to the foreign body. Plate made by Dr. Willis F. Manges.

or steel foreign body in a branch bronchus so small that a bronchoscope could not enter, and these are precisely the cases in which magnets are useless. Inasmuch as we have now developed methods of removing all of these as well as all other kinds of foreign bodies

with forceps or other instruments, it would seem that magnetic extraction is not needed. Moreover, in using a magnet there is no control over the position of the foreign body in relation to the bronchi invaded or to be traversed in extraction. Hence all the niceties of disentanglement and version are impossible. However, all experiment, if not carried out on living human subjects, should be encouraged. The author hastens to add that these are only his personal views.

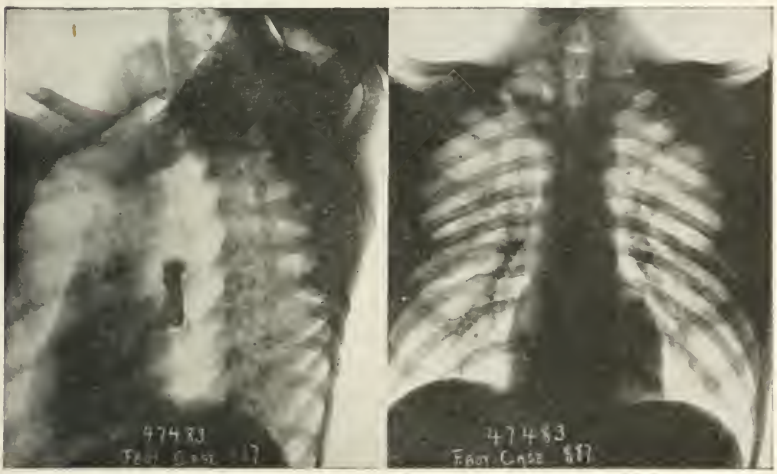


Fig. 32. Roentgenograms, anteroposterior and lateral, of a man, aged 28 years (Case No. Fbdy. 887), showing a very large artificial denture in the esophagus which before admission could not be pulled out of the esophagus. Removed through the mouth by esophagoscopy without anesthesia in 2 minutes and 11 seconds by the method illustrated in Fig. 33.

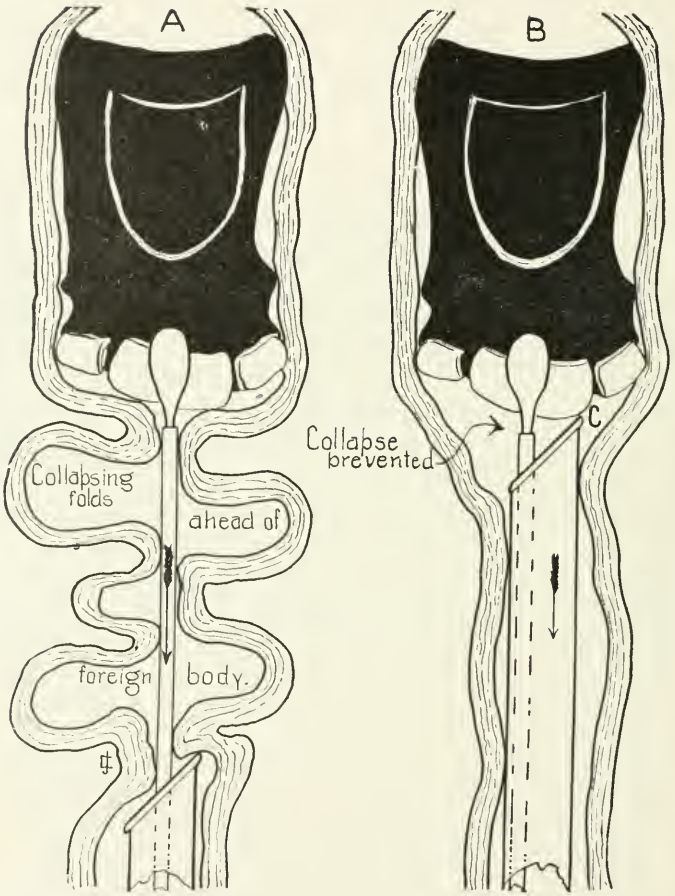


Fig. 33. Schematic illustration of the author's method of dealing with foreign bodies of very large size in the esophagus. In this particular case (See Fig. 32), selected for illustration, esophagoscopy prior to admission failed because nothing short of fatal traction could bring the artificial denture through the obstructing folds (shown in illustration A), which had been allowed to collapse in around the forceps by withdrawing the esophagoscope at a higher rate of speed than that of the forceps and foreign body. By bringing esophagoscope, forceps and foreign body all out together as one piece, the foreign body close against the tube-mouth (B) a heavy collapse of folds is impossible. Any fold that catches the foreign body can be readily manipulated out of the way by the tip of the tube-mouth (C). See also Figs. 20 and 21.

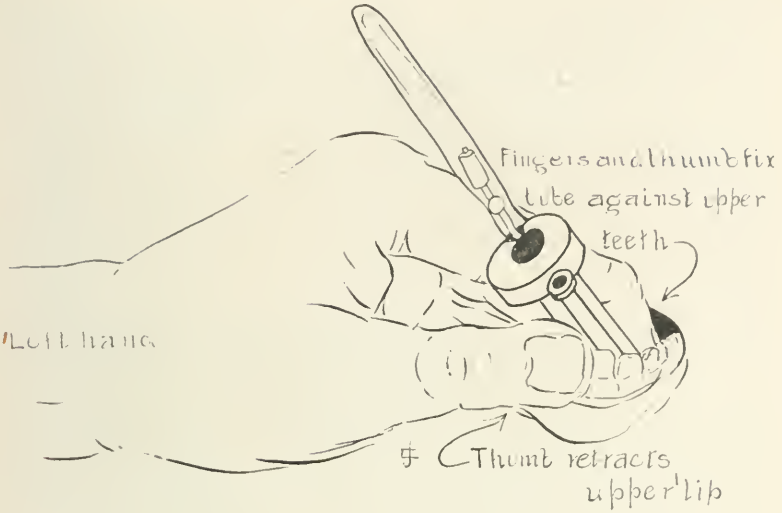


Fig. 34. Having found the foreign body and developed the proper presentation, by version or otherwise, the tube is fixed against the upper teeth with the thumb and finger of the left hand, as here shown, in order to maintain the presentation until forceps are inserted and the foreign body is properly grasped, according to the mechanical problem presented. Neglect of this precaution is the cause of many failures.

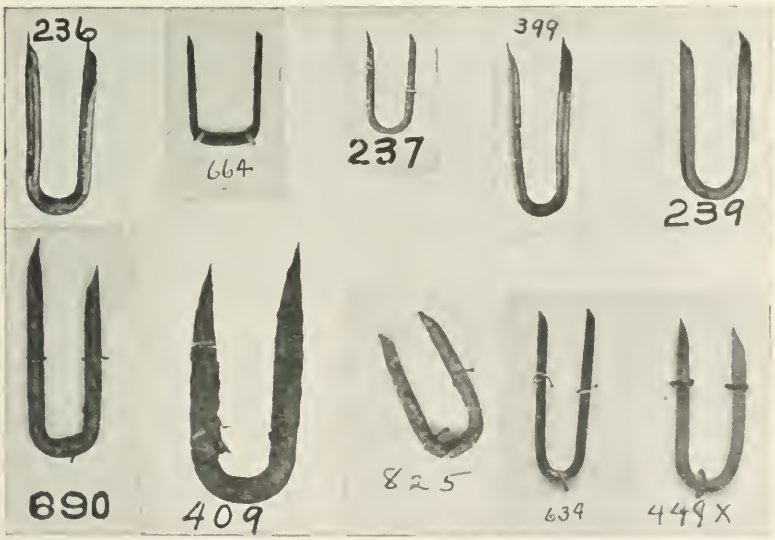


Fig. 35. Staples endoscopically removed from the air and food passages. Foreign body No. 825 was removed by posterior laryngeal version. All the others were removed by endobronchial or endoesophageal cephalic version. That is, the sharply pointed presenting extremities were turned back so that the staple could be safely withdrawn head first.

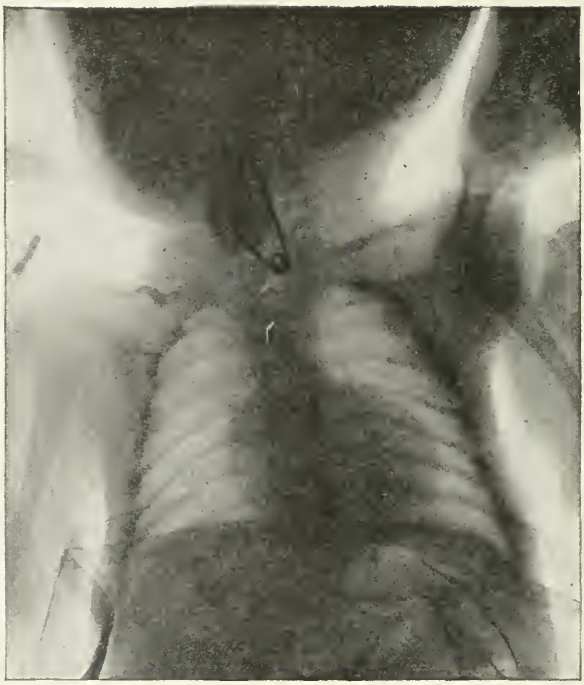
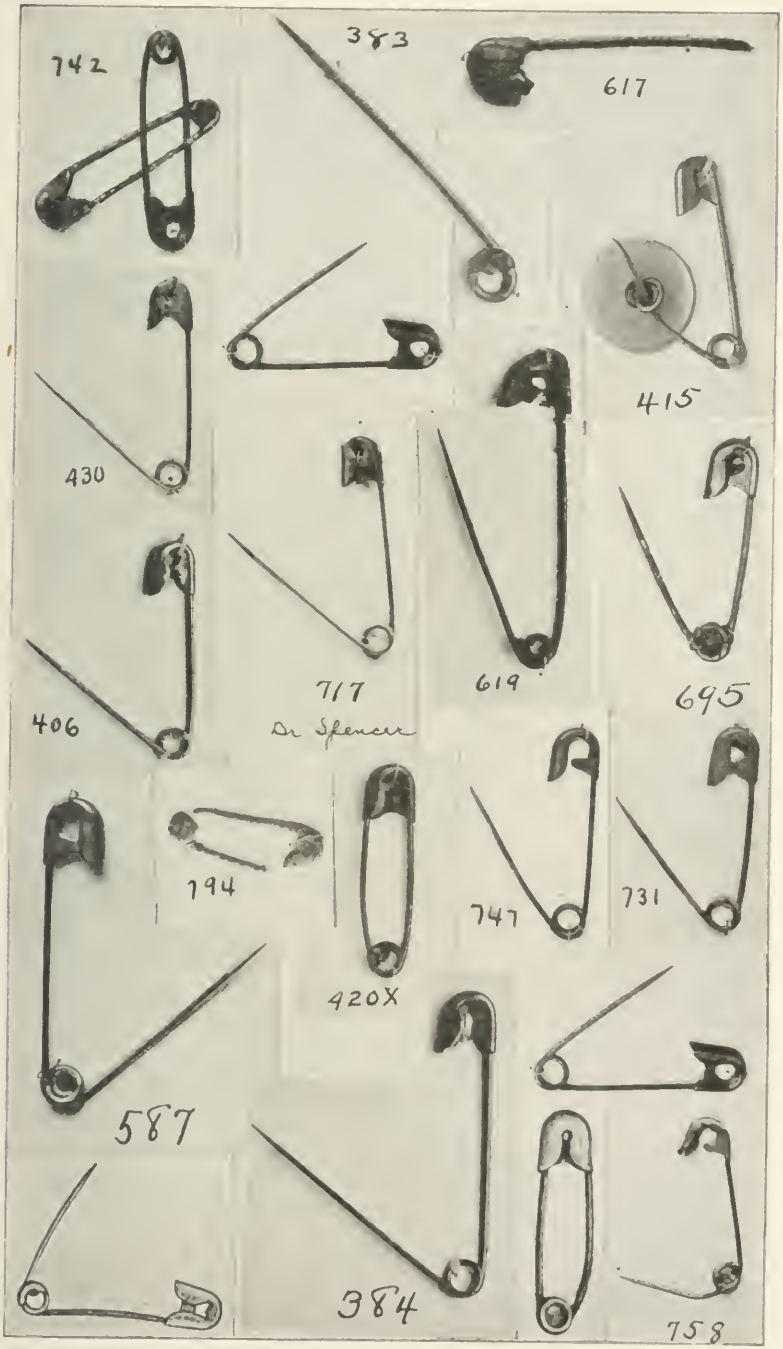


Fig 36. The safety pin problem complicated by a button. The button and pin had been swallowed together; the metallic ring of the button was on the pointed branch of the pin; the entire foreign body mass being anchored by the point of the pin having perforated the esophageal wall and having hooked itself under the tightly contracted cricopharyngeus muscle. The keeper end of the pin was in the post-cricoidal pharynx. The difficulties were increased by the size of the patient, an infant aged 10 days. The problem was solved and the pin was removed in one minute by the method illustrated in Fig. 12.



Figs. 37, 38 and 39. Some of the safety pins removed from the air and food passages at the Bronchoscopic Clinic by endoscopy through the mouth, without anesthesia. Some of the open pins were closed before removal, others were removed by the point protecting method, and still others were removed by "cephalic version."

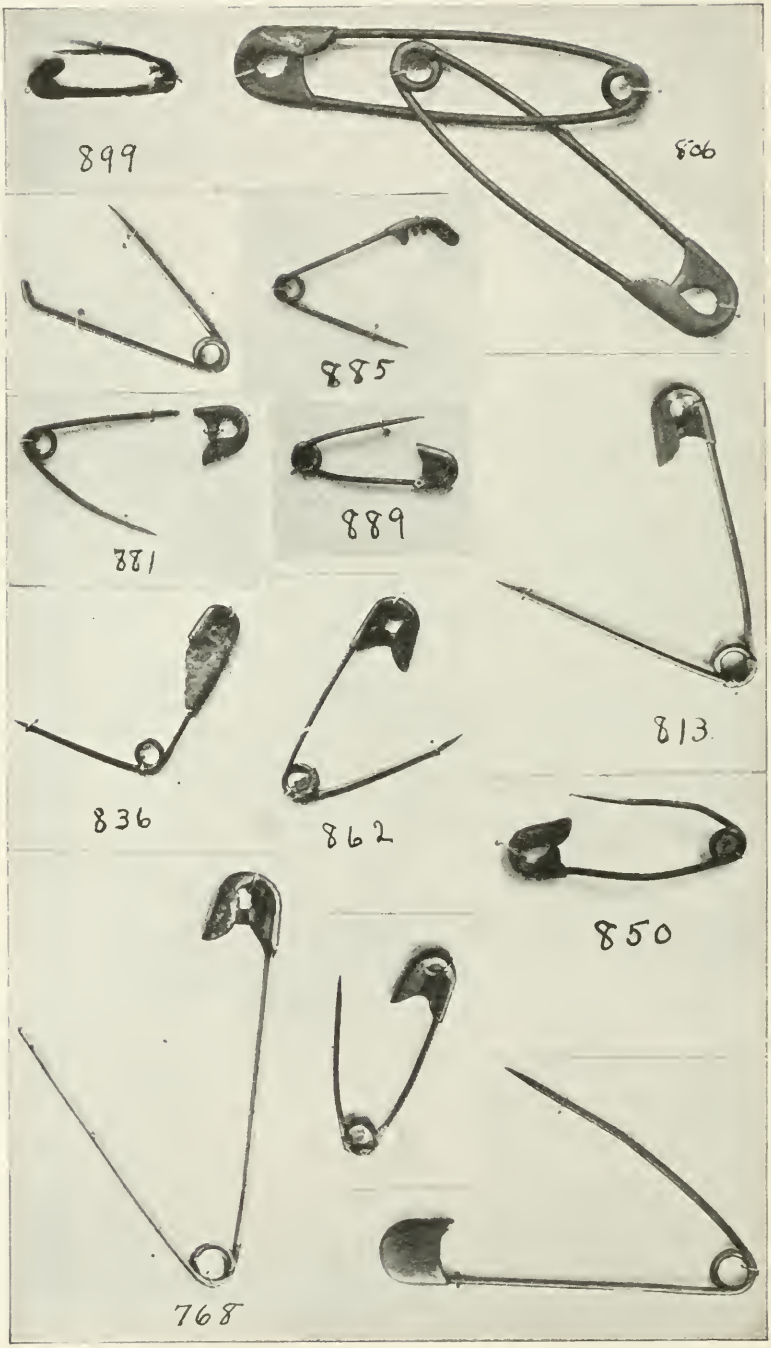


Fig. 38.

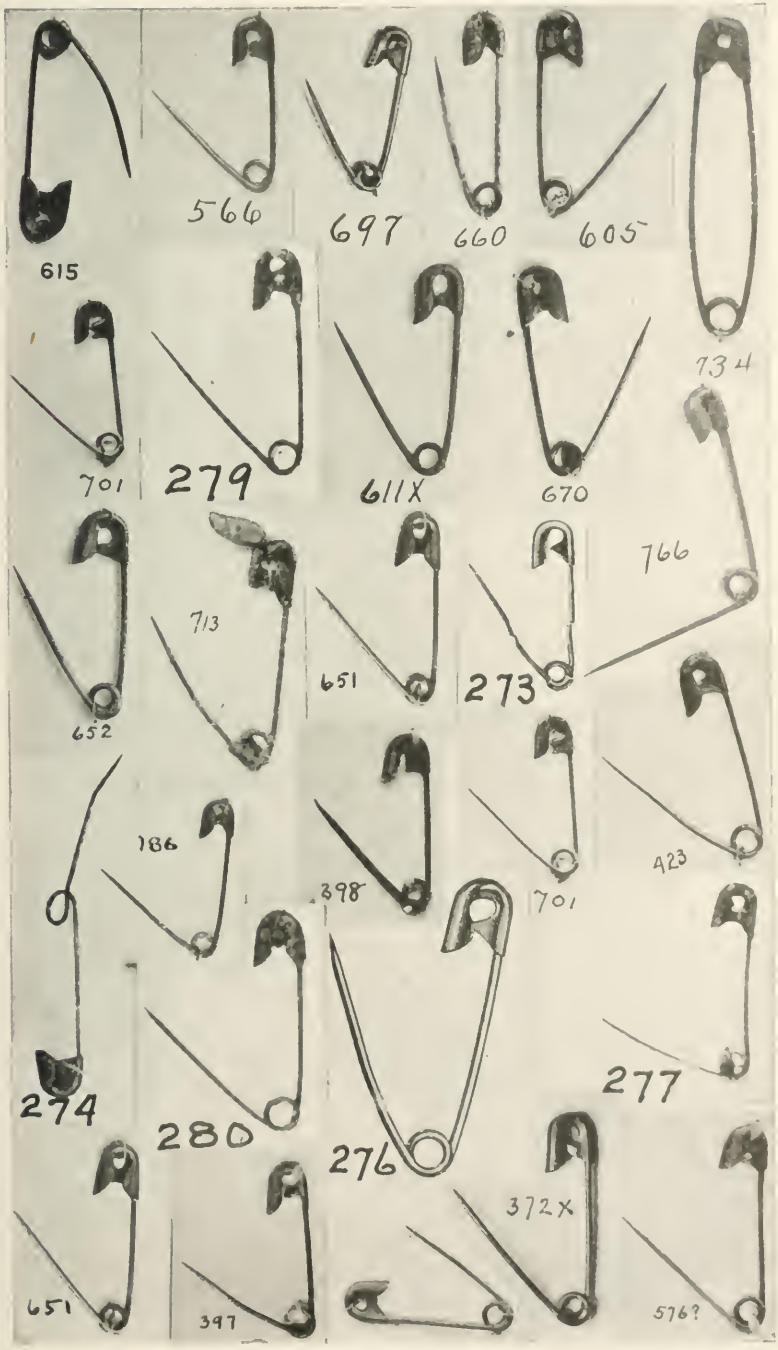

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Fig. 39.

Conclusions.

In all cases of bronchoscopic and esophagoscopic foreign body extraction the fundamental rule should be the avoidance of risk of mortality. Most of the operations in surgery are bimanual binocular procedures, whereas foreign-body endoscopy is a monocular, depth gauging procedure handicapped by limitations due to the smallness of the bronchi and the length and slenderness of the instruments. Differing thus from all previous training of the operator, safety and success require eyes and fingers that have been trained to the work. It is impossible, to say nothing of the inhumanity of the attempt, to get this training by work on patients. The time is insufficient. Hundreds of hours should be spent in educating the eye and the fingers with the bronchoscope working with all kinds of foreign bodies in a rubber tube, a cadaver and a living dog. Then when a case comes along a few hours preliminary working in the same way with a duplicate foreign body will provide the bronchoscopist with an experience such as he could not obtain from even hundreds of cases. If this plan of preliminary general practice followed by special practice for the particular case be conscientiously carried out I feel sure that any foreign body that has gone down the natural passages can be brought up the same way provided the following rules for the use of forceps or other extracting instruments are followed:

Rules for the Use of Forceps.

The following rules are those formulated by the author for his own use. Hence they are stated dogmatically. The terms "must" and "should" refer only to what the author says to himself. Each operator can modify them to suit his own personal experience or equation. For convenience the term bronchoscope is used. Almost all of the rules apply with equal force to the esophagoscope, the esophageal speculum and the direct laryngoscope.

1. Before insertion of forceps the long axis of the bronchoscope must be brought to correspond with that of the bronchus invaded by the foreign body.

2. The size and kind of forceps most suitable must be determined before introduction of the forceps.

3. The plane of expansion must be determined before the insertion of forceps.

4. The plane of expansion must be determined by the greatest plane of the intruder, the shape of the presenting part and the position of the forceps spaces.

5. There must be two forceps spaces, if two-jawed forceps are to be used, and they must be on opposite sides of the foreign body. If only one exists another must be made by manipulation of either the intruder or the tissues, normal or pathologic, or by working the intruder upward into a wider passage. If none exists two must be created.

6. Before applying forceps an unfavorable presentation must be converted into a favorable one by

(a) Creation of forceps space or spaces if only one, or none, exists.

(b) Partial or complete version if required for disentanglement, disimpaction, disengagement of a point, or proper presentation for seizure.

7. Great care is necessary to avoid seizing tissue along with the foreign body. In the esophagus a fold of the collapsing walls, or the cricopharyngeal fold; in the bronchi the spur between bronchial orifices, or even a duplication of the bronchial wall may be included in the grasp of the forceps. To pull, tear or twist with forceps so engaged usually means the death of the patient. If only the mucosa is nipped, fatal injury may not be inflicted, but the prolonged oozing of blood will diminish visibility by obscuring the field and by tinting the surface of the foreign body.

8. Traction should never be made until it is certain that the foreign body can be withdrawn without trauma to the tissues.

9. No matter how sure you are that the foreign body is properly seized and free to be withdrawn, never pull strongly enough to tear tissues apart. The safe degree of traction can be determined by the tactile sense trained by experiment on the cadaver.

10. In many instances traction must be preceded by pulsion, or by rotation, or by both, according to the mechanical problem present, in order to free a foreign body or its point.

11. When dealing with a pointed object, no traction should be made until the point is in the tube-mouth.

12. The index finger, being keenest in sense of manipulative touch should be used for traction and propulsion of forceps. To leave it free the middle and ring fingers are inserted in the rings of the forceps.

13. In case of foreign bodies that cannot be withdrawn through the bronchoscope or esophagoscope, the foreign body must be held closely against the distal tube-mouth by traction in the forceps until the resistance of contact is felt. Then the cannula of the forceps is firmly fixed against the side of the lumen of the proxi-

mal tube-mouth. This clamps the three elements, foreign body, bronchoscope and forceps, together as one piece, so that all come out together. If this is not done for foreign body trailing beyond the tube-mouth, as it is almost certain to do if each instrument is held independently, will permit glottic closure on the forceps cannula before the foreign body reaches the glottis. The almost inevitable result is the stripping off of the foreign body.

14. Before inserting forceps, the distance from the tube-mouth to the foreign body should be estimated. The jaws of the forceps going down the tube show in black silhouette against the lighted field. When the jaws reach the light they show up brightly lighted. This localization leaves only the distance from the tube mouth to the foreign body to be estimated by depth perception.

15. Until the glint of light on the forceps is seen the jaws should never be allowed to open; and in many cases they should not be allowed to open until the intruder is reached. They should, however, open before the intruder is touched and thus displaced.

16. Peanut kernels and similar friable objects must not be grasped so firmly as to crush them. To do this and yet hold the foreign body sufficiently firmly to withdraw it requires the training to be acquired only by the preliminary practice in crushing hundreds of peanut kernels with the bronchoscopic forceps. Allowance must be made for variations in resistance to crushing according to the degree of roasting and to a slight extent the degree of maceration.

17. Because of the limitations imposed by the necessity of working at a distance through a tube with one eye only, training of the eye and the fingers to the peculiar, ocularly guided, bimanual manipulations of forceps and tube are necessary to a large percentage of successes. As with all other manual things the knowledge of how to do them is not enough. Nerve cell habit should be established by practice until the manipulations are made sub-consciously as with the knife and fork in eating.

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DESCRIPTION OF COLOR-PLATE.

Endoscopic views illustrating mechanical problems encountered in cases of foreign bodies in the lungs.

Photoprocess reproductions of the author's oil color drawings.

A. Foreign body (a bone) impacted in a bronchus so tightly that no forceps-spaces existed. Before admission prolonged fruitless efforts under general anesthesia had been made to grasp the foreign body without realization of the impossibility of doing so in the absence of forceps-spaces. The inflammatory areola shows where the mucosa had been punched with the opened forceps.

B. Same patient as in A after I had created lateral forceps-spaces by withdrawing the foreign body to a higher level with a hook. Forceps were then readily applied and the foreign body was easily removed.

C. Mucosal trauma inflicted by the attempt to force forceps jaws onto a foreign body sagittally where no forceps-spaces existed ignoring good lateral forceps-spaces.

D. The trauma, indicated by the inflammation, the swollen dividing-spur and the patch of exudate on the mucosa of the left-hand orifice, was inflicted before admission by the faulty attempt to grasp the foreign body seen in the right hand orifice. The inclusion of the dividing-spur is easily avoided by the method shown in the schematic illustration, Fig. 11. My predecessor in the case stated that he had grasped the foreign body and had pulled as hard as he dared. As the foreign body was free to move it is certain the traction was being made upon forceps that included tissue as well as foreign body.

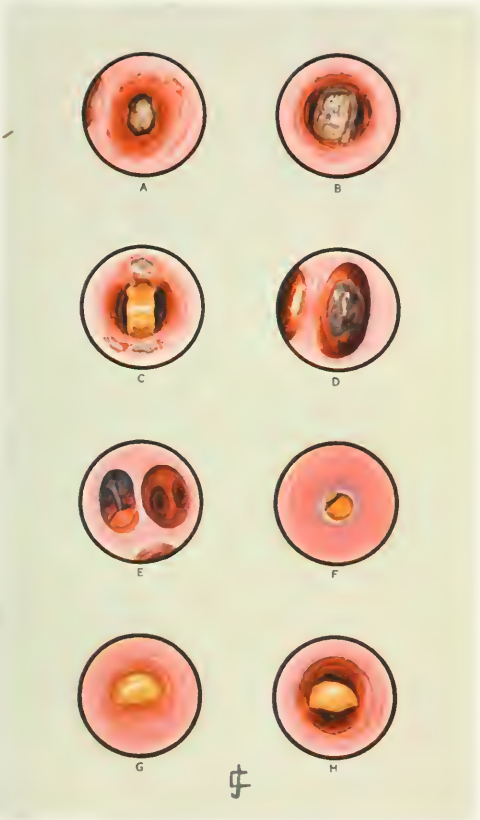
E. Endoscopic view in the lower-lobe bronchus showing a tack that, before admission, had been injudiciously pulled upon without first disengaging the point. Release of the point by the author's outward-rotation method after pushing the tack downward resulted in a prompt and safe removal.

F. Annular edematous (not fibrous) stenosis from the trauma inflicted before admission, in jamming the foreign body (a screw) down in a bronchus, in a faulty effort to grasp the screw-head in the absence of forceps-spaces. On admission only a tiny portion of the screw-head was visible and the situation of the slot of fillister indicated a slight tilting of the screw. The problem in this case was solved by withdrawing the screw to a new position above the edematous area with the closed side-curved forceps

used as a hook. The same forceps were then used in the usual way to grasp and remove the foreign body.

G. A peanut kernel in the bronchus of a child. During expiration, as here shown, no forceps-spaces existed because of the collapse of the bronchial walls during this phase of the respiratory cycle.

H. Immediately upon the beginning of inspiration the bronchial walls recede from the peanut kernel creating large forceps-spaces between it and the bronchial walls. In the case here illustrated the spaces are located anteriorly and posteriorly. It is early during this inspiratory stage of respiration that the forceps must be placed. The here-shown phenomenon of the opening and closing of the forceps-spaces in respiration is the mechanism by which air is trapped in the invaded lung or lobe, producing the obstructive emphysema that is diagnostic of the presence of a peanut kernel in the lung.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DISCUSSION.

Dr. Harris P. Mosher, Boston, said that in regard to coins, while they were comparatively easy to manipulate, there were one or two points to consider, viz. Presentation and proper forceps; one early case of the speaker covered him with shame for a time because he was operating on the child of a fellow physician, but finally he succeeded in getting the coin by tipping the patient's head up and the esophagoscope down so that a view was obtained above the foreign body. It was not always easy to get it out because there was a sphincter at the upper end of the esophagus which would rob one of the coin unless firmly grasped. In peanut cases, the speaker said he did not know why suction was not more used. There was danger of crushing with forceps and they should be used for the large portion and suction for the fragments. No one should attempt to remove foreign bodies unless he were mechanical. The right forceps should be had and the location of the foreign body should be known before going down.

Dr. R. C. Lynch, New Orleans, said that the interne could not remove a foreign body the first time successfully. Most of them would rather treat a suppurating ear or do a tonsillectomy, than try to handle a foreign body. It was necessary to see both lips of the coin. He was partial to the use of the straight edge tube, rather than the beveled tube. With peanuts the suction apparatus should be used. It was very successful in bronchus cases. With a floating foreign body, it must be fixed before attempted removal. In a case seen with a key, that portion that fits in the door was uppermost, and it was necessary to turn it over and catch the flat portion before removal.

Dr. John W. Murphy, Cincinnati, O., said that many difficulties were encountered. The forceps space was difficult to get with a coin, the edges of the mucous membrane often swelled over the obstruction, and edges of a coin were hard to find. If one tilted the coin it would be lost. One did not always get the foreign body at the first attempt, and Dr. Jackson would no doubt have the chance to make the second.

Dr. H. L. Lynah, New York, said that manikin study was important. Another point was not to let the family doctor interfere with one's work. That was the secret of Dr. Jackson's success. He ran away and hid for a week and studied the case, then came back and took the foreign body out. In regard to the ballooning lung, failures were often due to going to the wrong lung, where the shadow was dark. Dr. Friedberg used to use the same forceps that Dr. Jackson described as invented by Dr. Tucker.

Dr. Sidney Yankauer, New York, said that every word that Dr. Jackson had said contained a valuable suggestion, and the necessity of practicing on the manikin was very important. Practice in fishing foreign bodies out of a rubber tube was very helpful in keeping one's hand in and adding to skill in the work. Dr. Jackson did not go into statistics, but he would like to know what proportion of foreign bodies were of dental origin.

Dr. Richmond McKinney, Memphis, Tenn., asked what Dr. Jackson would have done in the case of obstruction of the main bronchus by a copper brad. This was in six weeks and was covered with pus. The oval surface was up and difficult to handle, but it was turned over and grasped and withdrawn. How would Dr. Jackson have worked that?

Dr. William B. Chamberlin, Cleveland, O., said that the haste and zeal to sieze a foreign body was similar to what hunters called "buck fever", they were so anxious to shoot that they missed. The foreign body must be studied in situ and the forceps spaces proved before interference.

Dr. Chevalier Jackson, closing, said that he agreed with Dr. Mosher in regard to the sphincter. The foreign body must be kept close to the end of the tube, or the sphincter would close on the forceps and rob one of the prey. Suction was valuable in dealing with the peanut problem and removed dangerous secretion. A mechanical bent was useful, but most laryngologists were more or less mechanical, one had only to look at the formidable array of instruments outside to see that. It took more than that; one must have looked through the bronchoscope once or twice before one removed the foreign body. In regard to tilting the coin, one must be very careful. The beveled end of the esophagoscope could be used to pull back the folds. Dr. Murphy spoke of three minutes versus three hours,—sometimes they worked one hour on several occasions. Dr. Lynah mentioned the lung shadow. That was a common mistake. The radiographs were all right, but the interpretation was wrong. In regard to the forceps, if Dr. Friedberg had originated them, he owed an apology to his friend's memory. In regard to cases of dental origin, they had had about 30 cases in a total of 880. In regard to statistics, he always had a member of the family or the stenographer work them out, as he had not a mechanical brain. Each case presented different problems which must be worked out by the operator.

THE FUNCTION OF THE MIDDLE EAR APPARATUS IN THE PRESERVATION OF EQUILIBRIUM.

A NEW THEORY.*

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The various theories of the functions of the tympanic membrane and the ossicles have changed but little since the time of Hemholtz. His theory of the mechanism of sound conduction has stood the test of time.

Politzer corroborated the work of Hemholtz by experimental researches, and added to the middle ear apparatus the function of accommodation for low tones. Zimmerman believed that sound was conducted by molecular motion rather than molar motion, but as Wales states, this theory is not supported by clinical experience. There is no doubt but that the tympanic membrane and the middle ear apparatus are necessary for perfect hearing, and unquestionably the antagonistic arrangement of the tensor tympani and of the stapedius muscles is an important factor in varying the pressure of the intra-labyrinthine fluid in order that the endolymph be maintained at its maximum degree of conductivity. Within recent years experimentation and research have been largely confined to the vestibular apparatus, and the semicircular canals. The brilliant work of Flourens and Ewald, and the investigations in space by Von Cyon were the beginning of research by various scientists, whose effort seemed to culminate in the laws of equilibrium as evolved by Barany. For this reason there has been but little or no interest in any further investigation of the functions of the middle ear apparatus.

For the past three years I have been engaged in proving a theory of an additional function of the middle ear apparatus which I believe is original, and which I would like to present to your society.

Aural vertigo (excluding Menieres Disease) can be divided into two main classes, according to the pathological changes occurring in the middle ear. In the first class, there is a general adhesive inflammatory condition of the joints of the ossicles, with a more or less fixation of the stapes, of long duration. The tympanic mem-

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brane shows retraction and thickening. Vertiginous attacks in this class generally occur suddenly; caused by a sudden change of intralabyrinthine pressure, or due to an absorption from some septic focus, or a toxemia, as from indiscretion in diet, etc. In other words, while the aural condition is in a state of instability, a secondary stimulus is necessary to cause the attack.

The second class, which for the sake of clearness should again be divided into two classes according to pathology and symptoms. In class A there is but a moderate impairment of hearing, the tympanic membrane may or may not show atrophy, and while the malleus may be retracted, the membrane is greatly relaxed, due either to auto-inflation or prolonged Politzeration. The attacks of vertigo are never of the apoplectic type as occur in the first class, but there is a general feeling of instability and often an inability to walk without swaying. A general feeling of fullness and lack of mental clearness are common. In B, the symptoms are similar—the pathological condition present being the result of suppuration—such as depressed cicatrices and markedly distended tympanic membrane which are often largely of scar tissue.

Before discussing the theory may I briefly cite four cases to illustrate the above? A, female, of 35, complained for a long time of a certain amount of instability in walking and "light headedness." Had been treated for gastric and intestinal disturbance—for the vetrigo. Examination showed marked relaxation of the tympanic membrane, tubes patent, hearing good, otherwise negative. B, male, of 50. Symptoms similar to above. Intra-nasal operation has been performed. Examination revealed relaxed tympanic membrane from continued inflation. Tubes patent. Otherwise negative. C, male. Has had attacks of vertigo for years, so severe that it was impossible to travel without companion. Constant feeling of insecurity. Head, feeling of congestion and mental obscurity. Examination: A. S. tympanic membrane composed of cicatrices, with a depressed cicatrix over stapes. A. D. marked adhesive condition due to suppuration. Hearing very poor in both ears. Tubes fairly patent. D, male, 40. At times unable to work because of danger of falling into machine. Would often be incapacitated for several days each month. Examination of A. D. tympanic membrane occupied posteriorly with large cicatrix. Tubes fairly patent. A. S. normal.

All of the above patients secured great relief from the simple application of a rice paper splint as first used in 1872 by Dr. C. J. Blake. These splints were used for the purpose of aiding the

healing of perforations, and to increase the hearing power in cases of relaxation of the tympanic membrane. It was while using the splints that I first observed an improvement, and often complete relief of all symptoms of vertigo, and the freedom from a feeling of instability and head congestion. In cases A and B a piece of rice paper, moistened with water, was placed upon the relaxed posterior segment of the tympanic membranes. In both patients there was immediately a sense of clearness and an absence of "light headedness." The "sizing" of the paper is sufficient to act as an adhesive, and at times the splint will remain in place for one to two months, but usually as Dr. Blake stated—the tendency is for the splint to be carried to the posterior canal wall by the growth of the epidermis.

In case C a very small splint was placed upon the depressed cicatrix and its edge caught in a niche, which held it in place, at one time for a period of four months. This patient is a manufacturer who, as stated, travels a great deal and who did not dare to go alone anywhere. Immediately upon the application of the splint the hearing was increased 50% and all sensation of instability disappeared, and for the past three years he has made various trips and has driven his car in perfect comfort. The instant he feels a sensation of slight instability he knows the splint has become loosened and requires attention.

In case D the entire posterior segment is a cicatrix, as thin as tissue paper. Here a splint covering the entire relaxed portion of the tympanic membrane was necessary. In this case the change is most marked—his sensation of equilibrium becomes normal, and all mental confusion disappears. In other patients the results are not so spectacular, the chief changes being a marked clearness of sounds and freedom from mental confusion. The tympanic membrane situated in an air medium acts as a pressure diaphragm, the proper tension being maintained (under normal tubal conditions) by the antagonistic action of the stapedius and the tensor tympanic muscles, innervated by the seventh and the fifth nerves respectively. In the pathological conditions where there is gradual ankylosis of the ossicles, the stabilizing influence is exerted only so long as the stapes remains mobile, but given a relaxed tympanic membrane with mobile stapes, then any rapid change in air and blood pressure will immediately be reflected into a feeling of unstable equilibrium due to the loss of the restraining and stabilizing action of the tympanic membrane. Thus it is seen that the middle ear mechanism has a function as important as that of sound conduc-

tion, and leads us to increase our endeavors to eliminate all factors and procedures which will tend to overthrow this delicate stabilization of the tympanic apparatus.

Theory.

From observations upon a large number of cases (the above being typical examples) I feel justified in introducing the theory that in order to maintain a normal state of equilibrium the stabilizing influence of the tympanic membrane and the ossicular chain are necessary, and there exists under normal conditions a wonderfully balanced mechanism for this purpose.

Corollaries.

1. The necessity of teaching children the proper way to empty the nose; by closing and blowing one nostril at a time, in order to prevent auto-inflation.
2. If inflation is practiced, to watch carefully for the first sign of distention.
3. The deprecation of advising patients to practice auto-inflation and the prescribing of the Politzer air bag for home use.
4. The necessity of early incision of the tympanic membrane to avoid spontaneous rupture, and the importance of preventing long continued discharge.

THE GRAY FUNDUS AS A DIAGNOSTIC SIGN OF FOCAL INFECTION WITH ESPECIAL REFERENCE TO EMPYEMA AND OTHER CHRONIC DISEASES OF THE EAR, NOSE AND THROAT.*

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The purpose of reporting my observations of fundus findings to the Oto-laryngologists,—a subject which apparently should be of especial interest to the Ophthalmologist—is to bring to their practical use a diagnostic sign of focal infection which should be especially useful in their field of endeavor. No question of doubt is nowadays given to the importance of focal infection as the etiological factor of many of the diseases which medicine is called upon to treat. That the most frequent location of these foci is in the field of the oto-laryngologist almost goes without saying when one considers the nasal accessory sinuses—the various tonsils—lingual, tubal, pharyngeal and faucial—the teeth, the middle ear and mastoid and the ease and frequency with which they become involved.

There should be no reason why the oto-laryngologist should not make use of the ophthalmoscope in making his examinations if by its means he can improve his service to his patients. It can be done easily and quickly though it involves both practice and experience. The idea is not to make an exact diagnosis of ocular disease, but to find out if the patient is suffering from an extension of disease from a focus. While Gray Fundus or the subject matter of this paper has nothing to do with choked disc and optic neuritis, the oto-laryngologist who takes the time and trouble to familiarize himself with the ophthalmoscope enough to diagnose these conditions will be well repaid for his effort.

By the installation of a few drops of a four per cent. cocaine solution into the conjunctiva at the beginning of one's examination, the patient's pupils will be sufficiently dilated to make the ophthalmoscopic observation easily and quickly without discomfort to the patient.

There is no question about the value of fundus findings to the internist but the oto-laryngologist has depended on the opthalmologist for his report. No matter how well the ophthalmologist

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may describe the condition, it is hard for the oto-laryngologist to grasp in his mind the following things which go toward helping to make a decision—is this acute?—is it much?—is it little?—is it extending or receding? One should be able to see these things for himself—especially in considering the obscure complaints showing little infection of tonsils or slightly discharging middle ears, etc.

The term Gray Fundus is chosen as the name for the condition of change in the normal fundus due to the action of the toxins produced by the infection, because of the characteristic, uniform, gray color. The grayness begins at the disc of the optic nerve where it develops its greatest intensity of color and becomes lighter in shade as it extends farther outward. The grayness is uniform and not streaked with darker or reddish lines as in the case of an old, scarred chorioiditis or lues. One condition of the fundus which might be mistaken for the Gray Fundus is the normal negroid fundus. The fundus of any of the other races than the Caucasian shows much more pigment and has a gray to a grayish black appearance. In case of a pure blood Negro, Indian or any of the higher pigmented races, the intensity of the color is so much that one would not easily become confused after once examining such a fundus. It is, however, an entirely different matter when it comes to differentiating between the normal fundus of a Mulatto or half-breed Indian. The color is more intense than the Gray Fundus which is being described and the reflections of the thicker chorioidal blood vessels play with much greater intensity as the eye ground is illuminated, than in the typical Gray Fundus or normal Caucasian.

The exact change which takes place in the chorioid and retina to form a Gray Fundus is thus explained. We know that normally the retina is a transparent layer and also that the retinal epithelium is nourished from the chorioidal blood vessels. These fine chorioidal blood vessels become involved as the result of the intoxication by the products of the focal infection. This in turn diminishes the nourishment which the chorioid normally supplies to the retinal epithelium and causes its pigment to raise and deposit in its surface. The exact process is a degenerative one and must be defined, owing to the chorioidal involvement as well, as of a chronic retinitis. The color is produced by a fine, even infiltration of both the chorioid and the retina. When the condition becomes far advanced the ophthalmologist terms the condition a degenerative retinitis. This degenerative retinitis is not a case for the ophthalmologist

to treat any further than the relief of painful and distressing symptoms of asthenopia and headaches. While proximity of the focus has very little to do with this process, I think that it may safely be said that when the focus is located close by, as in the sphenoid or ethmoid, that the patient suffers greater distress. Though both the symptoms and condition are very much the same whether the focus is in close proximity or any of the other usual locations such as: intestinal tract, prostate, Fallopian tubes, kidney or gall bladder.

Much has been written in rhinological literature about inflammation of the nasal accessory sinuses as a causative agent in optic neuritis. This condition is very easy to diagnose when there is a swelling of the optic disc and loss of vision accompanied by an evident acute empyema or engorgement of sphenoid or middle turbinate. But except in a very few absolutely acute cases these patients have previously consulted oto-laryngologists or ophthalmologists without having their condition diagnosed when it was in a sub-acute stage. Most of these cases are undoubtedly acute exacerbations of an old trouble which should have been recognized and treated before. A spongy diseased mucous membrane lining of one of the nasal sinuses has been the source of a long standing discomfort and complaint and formed a gray fundus. The X-ray in these cases, while valuable, is often a very difficult means of diagnosis and in many instances is of no assistance. Let one be ever so careful and still it is possible to overlook such an obscure source of trouble. The gray fundus does not locate the source, but one may rest assured that there is infection some place and that it must be found. In cases where there is a refractive error of sufficient import to cause eye-strain, the correction will give a temporary relief from symptoms and thus blind one to the fact that there is a causative factor which has not been eliminated.

In taking up the cases of Gray Fundus for study, I have divided the cases into classes according to age and have described a composit case for each classification. First class, children up to fourteen years; second, young adults from fourteen to twenty years; third, adults from twenty to forty; and the fourth, from the age of forty on. By way of explanation of reason for describing only composite case in each classification, will say that the number of cases examined and records kept since the beginning of my observations nine years ago, amounts to several thousands. For instance, in the first class of children up to fourteen years of age, records

were kept on 203 who were examined and operated for tonsillectomy and adenectomy for the year 1919.

A typical case of hypertrophied tonsils and adenoids in a child of eight years with enlarged cervical glands and giving a history of repeated colds, croup, earache, over a period of a few years, will give an excellent picture of the Gray Fundus. The fundus will be dark gray in color and the child will complain of headaches in school. The diagnosis in a case of this kind is, of course, obvious and the gray fundus is only valuable in giving one a clue to the duration of the involvement and its extent. Let this child be operated and the focus of infection eliminated, there will be a gradual diminution of the intensity of the grayness within six months. After a year there will be a pinkish cast over the gray area with the apparent gradual return to the normal yellowish-red. Should the individual not develop another infected focus the entire grayish patch will resolve except for a small area at the nasal side of the disc which has remained constant in all the cases that I have observed. The Gray Fundus has been especially valuable in the above sort of case which was complicated with a diseased nasal sinus. After the tonsillectomy and adenoidectomy the Gray Fundus would still persist, though the nasal examination would show nothing but a boggy middle turbinate. In these cases it would be necessary to eradicate the nasal accessory sinus disease before the patient was on the road to complete recovery. It is also valuable in the cases of children who complain of headaches in school, who had only an apparent mild involvement of the tonsil with little or no hypertrophy. These cases were advised operation and were greatly benefited.

In the second classification of young adults of from fourteen to twenty years, we find perhaps the greatest use of the Gray Fundus as a diagnostic symptom of absorption of toxins. At this age there is a recession in size of the lymphoid bodies of the nose and throat. Nature is overcoming the difficulty of hypertrophied tonsils and adenoids or turbinates by enlarging the pharynx and allowing the individual greater capacity of the upper air passages. But if the patient has Gray Fundus and the accompanying asthenopic symptoms, one may be sure that there is still toxic absorption and advise clearing up of the trouble when there might otherwise be a question as to the advisability of an operation to the detriment of the patient. It is also at this age when these patients with the chronic and intermittently suppurating inflammations of the middle ear, that per-

sist from the diseases of childhood, come to consult the oto-laryngologist. It is a very serious matter and is often hard to decide whether it is necessary to do a mastoidectomy or radical operation or to continue with other treatment. A Gray Fundus indicates toxic absorption in these cases and helps to justify advising a more radical procedure than would be allowable where no absorption is taking place. The Gray Fundus at this age is not so intense as it is in the previous classification except in the more serious cases. The color is lighter but the area of grayness is larger. Eradication of the pus focus in these cases causes a diminution of intensity and the only difference between this class and the first is that the resolution is more gradual in requiring about two years to accomplish the same change as in one year of the first class.

During the period of twenty to forty years the patients coming to the oto-laryngologists for consultation, besides complaining of the different asthenopic symptoms, begin to add more frequently the symptoms of pains such as neuritis, myositis or rheumatic pains in general. It is these which baffle so many in finding the focus of infection or puzzle them to be sure that they are dealing with focal infection. The gray fundus in these cases is a help toward the correct diagnosis.

In the clearing up of the foci at this age, the same lessening of intensity of color is observed though it is still much slower. It is also very often necessary to call on the ophthalmologist for a correct refraction and other treatment as the process has usually been of such long standing as to make protection of the inflamed retina necessary.

Of the cases which have persisted to the age of forty, little need be said of the Gray Fundus, as it has become a true degenerate retinitis with large deposit of pigment. It is nevertheless an important sign of toxic absorption and should be the cause of diligent search to find and eradicate the pus focus. It is surprising to note the improvement that will take place in the Gray Fundus after they have been successfully operated. I recall the case of a woman 55 years of age who was advised by one of our best ophthalmologists that she had a degenerative retinitis and that there was no great relief to be expected. The tonsils happened to be the focus in this case, which were removed to the great improvement of the patient's health and a remarkable change in her fundus.

When I first reported my observation of the Gray Fundus in 1912, I was allowed by the courtesy of the general surgeon practis-

ing in the same hospital to make a series of fundus examinations in patients who had been operated for chronic appendicitis, in which the pathology proved definitely that the condition had been chronic. In all of these cases a Gray Fundus of varying intensity was found. I also found and proved to my own satisfaction, at least, that the original focus was oftentimes in the faucial tonsils. These patients who did not show other foci than the appendix, showed a gradual improvement in their fundus condition.

The conclusion to be drawn from these investigations is that the Gray Fundus is a fairly constant symptom of toxic absorption. Its value depends on the ability of the examiner in becoming proficient and developing experience in its use.

CERTAIN OBSERVATIONS IN RELATION TO THE SURGERY OF THE SPHENOID SINUS.

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Introduction—About ten years ago opportunity was afforded to observe a very puzzling case in the clinic of a well known internist. This patient was seen by a number of consultants, but the diagnosis was established only at autopsy. It was abscess of a sphenoid sinus with meningitis. At this same time I was also fortunate to be able to study with Skillern, who was then working on the material for the first edition of his excellent book, "The Accessory Sinuses." Ever since, the lure of the sphenoid sinus has been persistent and insistent. This interest has been stimulated by the writings of Skillern, Sluder, Loeb, and others. In our own clinic we have been struck with the more than occasional case in which the sphenoid sinus seemed to be the site of persistent pathology. In many cases of multiple sinusitis it is inevitable that the sphenoid should participate. Shambaugh (1) reports a case of acute abscess of one sphenoid sinus in which the posterior ethmoid cells were also involved. He remarks that infection restricted to the sphenoid sinus in which other nasal accessory sinuses are not involved, is rather the exception. In this he evidently refers to the acute cases. But in not a few chronic cases, where either in our own clinic or in other clinics the pathology of septum, middle turbinates, and other sinuses had been either corrected or excluded, the patient continued to suffer with obscure symptoms apparently of nasal origin. Persistent nasopharyngitis, lateral pharyngitis, recurrent rhinitis and indefinite aches and pains in the head without evident cause led us more and more frequently to suspect the sphenoid sinus. The recognition of the more severe cases by the obvious clinical picture invited us to seek the milder and less clear cut ones. Further, the conclusion was reached that it is just as logical to expect a residual infection of low grade in one or both sphenoid sinuses after an intense rhinitis, as it is to look for the same in a maxillary or frontal sinus.

Each spring brings its aftermath of chronic cases, secondary to the neglected acute rhinitis cases of the winter. (2) In many of these the ethmoid labyrinth may have recovered completely from the acute infection and the general nasal mucosa look normal.

Remaining, however, there may be a frontal, a maxillary, or a sphenoidal relic with the more or less indefinite mild chronic course. It is to the surgical care of such sphenoid cases that these observations are directed.

The Submucous Sphenoid Sinus Operation.

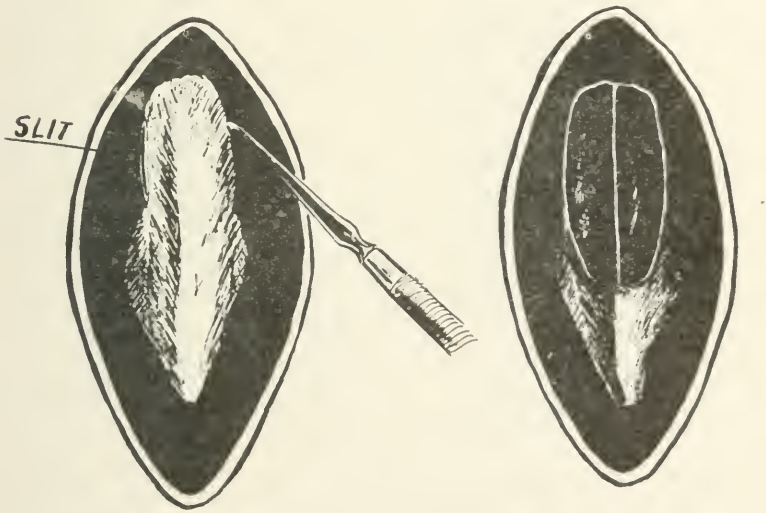
Surgical Procedure—The surgical procedure that has been followed in the later of these cases, consists in a submucous resection of the nasal septum, with the removal of considerable of the anterior wall of the sinuses down to the lower angle, and when possible even a bit of the floor of the sinus. The septum between the sinuses may be partially or completely removed as indicated by the pathology present.

When the septal operation is carried far back, the vertical plate leads to the sphenoidal crest. This is covered below by the anterior portion of the base of the vomer under which it runs into the rostrum of the sphenoid. The alae of the vomer, anteriorly, spread laterally to cover the inner borders of the spheno-turbinals. After the crest is reached the mucous membrane over the anterior surface of the sphenoid is elevated, thus giving wide exposure of the field. Slits are next made in the thin bony wall of the sinuses between the crest and the spheno-turbinals. These slits may be continued downward into the thinner borders of the alae of the base of the vomer. Occasionally this may be done and the anterior bony wall of the sinuses removed without lacerating the sinus mucosa. The only difficulty arises from the varying anatomy and relations of the sinuses to each other.

After the slits are made forceps may be slipped astride the upper portion of the crest which is removed as far as the base of the vomer. Considerable difficulty is experienced if an attempt is made to remove the crest without first delimiting and partially freeing it as mentioned. The removal may be continued downward to insure good exposure of the anterior wall of the sinuses and of the floor as well. This includes the biting away of the anterior portion of the vomer back to the rostrum. The special advantage of this is to obviate the leaving of a lip or retaining wall at the floor of the sinus. This clean removal permits the chimney action during inspiration, described by Canfield in relation to the maxillary sinus. In his operation he urges the removal of the deepest portion of the median wall for this purpose. The anterior inferior angle of the sphenoid sinus, while not acutely angulated, often presents a sort of reservoir or

cupping. This lays it open to suspicion as an area of persistent pathology as pointed out by Denker in relation to the anterior superior angle of the maxillary sinus.

In the course of the operation we have found occasion to correct middle turbinate pathology also, by such procedures as infraction and proper placement of turbinates in relation to the straightened septum, and correction of the so-called cystic middle turbinates. The first step with such a cellular turbinate is to plunge the angle knife into the center of its anterior end. The contained cell is thus punctured. The blade of the scissors is now introduced and the incision continued inferiorly and posteriorly, and superiorly and posteriorly to the extent of the cell. A snare is slipped over the lateral half of the split turbinate and that half thus removed



Removal of Sphenoidal Crest.

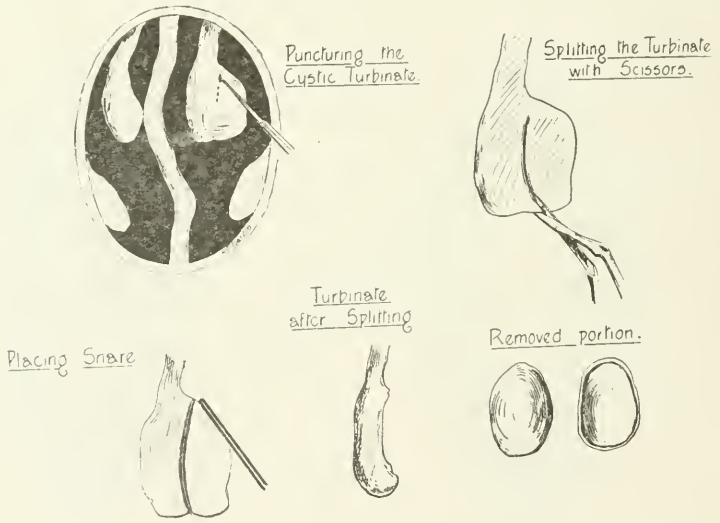
slightly back of the posterior end of the cell. This reduces the lateral diameter of the turbinate from 60 to 75 per cent. without diminishing the area of mucous membrane and with a minimum area of surgical wound. The remaining median shell may be squeezed or compressed by a flat forceps and infracted, and thus straightened, moulded, and placed to best advantage in relation to the new septal plane. This also facilitates the inspection and work upon the anterior sphenoidal wall.

After the bone work is completed and the turbinates are infracted, the mucous membrane of the anterior walls of the sphenoid sinuses may be removed by knife, forceps and scissors. This is

done through a long, nasal speculum that gently presses aside the septum and the posterior end of the opposing turbinate.

The aftercare is the aftercare of the submucous resection. A light gauze packing is used for the septal flaps, but not carried far back in the nose. We have not packed any sinus. In some of our cases the Lynch septal splints have been used.

In two or three cases the thickness of the lower portion of the bony sinus wall has made a bone biting forceps inadequate to remove as low as desired. A chisel has been held with the edge vertical, or at right angles to the floor of the sinus, and two or three nicks cut into the heavier bone. After this, gentle rocking of the demarked fragments easily removes them. In one case



considerable bleeding was encountered but it was not serious. The sinus mucous membrane is pushed aside rather than lacerated. Only at the conclusion of the bony operation is the nasal mucous membrane removed overlying the sinus, and finally the sinus mucous membrane itself correspondingly trimmed away.

No irrigation or antiseptics have been used in the sinuses. The rhinorrhea cerebrospinalis noted by Skillern has not been observed.

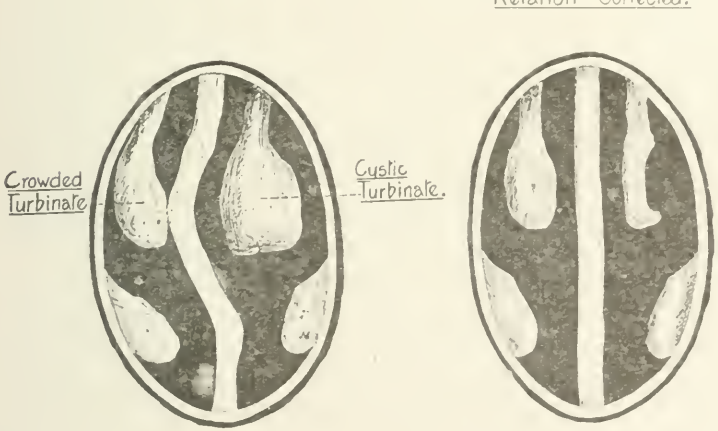
In opening these sinuses we have found mucus varying from nearly clear to decidedly purulent. We have found the mucosa apparently normal after being wiped out and have found it congested, swollen and thickened in local areas.

Cavanaugh reports one of his cases in which the opening of a dry sinus was followed by the immediate relief of a long continued pressure. He believes this to have been a vacuum sphenoidal sinus.

Classification. In diagnosis and decision, the classification given by Skillern (3) has been followed.

1. *Acute Inflammation.* These cases are incidental to acute nasal infections and are not surgical. Under proper care practically all of them should resolve.

2. *Chronic Catarrhal Inflammation.* This is the mildest, most common and least recognized form of sinusitis. Its history and symptoms are persistent pharyngitis sicca, pharyngitis lateralis, postnasal discharge, fullness and dryness in the nasopharynx and



hawking and rasping of the throat in the morning. It rarely becomes frankly purulent or shows marked exacerbations but continues about the same indefinitely.

3. *Chronic Purulent Inflammation.* In this form the mucosa is infected in local areas, some portions being more or less healthy. The characteristics of this type are remittent. There are exacerbations with pronounced symptoms such as profuse discharge and typical headaches. During the quiescent stage the symptoms abate, but there is always some postnasal discharge, dull headache, and an extreme tendency to "catch cold."

In both of these chronic forms Skillern advocates his conservative operation. In this operation the normal nasal structures are almost undisturbed. It would appear that they are also quite suitable

for the procedure outlined herein, especially when the anatomical conformation of the septum and turbinates calls for correction. The microscopic examination made of tissue taken at autopsy from the sphenoid sinus by J. D. Cowie and J. S. Fraser (quoted by Cavanaugh) shows that slight catarrhal changes in the mucous membrane were often found but genuine suppuration was rare.

4. *Chronic Purulent Inflammation with Permanent Pathologic Changes in the Mucosa and Underlying Bone.* These cases are more severe or advanced cases and more rare than the other two. They are the typical sphenoidal empyema of the text books. All the classical symptoms appear and are marked. There are headache, mental symptoms, cacosmia, marked postnasal secretion, sore throat, hoarseness, disturbances of bronchi and stomach and ocular symptoms. From such cases we believe the sphenopalatine ganglion syndrome may often arise. These are the cases of hyperlastic sphenoiditis described by Sluder. They probably result from long continued irritation of the cavity. If diagnosed in the early stage and properly handled they would never develop into this type and many cases of ganglion symptoms could be avoided. (4). It was for such chronic cases that sphenoid surgery was first utilized and the radical intranasal operation devised, as described by Hajek. Inasmuch as the posterior ethmoid cells are usually involved it would seem that the radical operation is the one of choice.

5. *Mucocele.* Such pent up collections of mucoid material are more or less rare. Skillern advises the radical operation but it would seem that the submucous sphenoid operation would be justifiable at least as the first attempt in any case with deviated septum.

6. *Pyocele.* This collection of pent up pus resulting from a sudden closure of the ostium or an acute infection of a mucocele, is indeed a rare incident. It is, on the other hand, a very grave condition and is probably the class to which belongs the case noted above. A prompt and radical operation is indicated. It is likely that the packing, congestion and edema incidental to the submucous operation would negative even the trial of the same for such cases. In such a case presenting marked septal deviation the operation might be carried to the removal of the sphenoidal crest and then completed outside the septal flaps. This would mean the removal of the mucosa overlying the anterior surface of the sinus before the bone wall was attacked. Further, the more virulent nature of the pus would lead to the possibility of a complication of healing of the septal flaps. In none of the cases performed for

sinuses of suitable type has there been any complicating infection or trouble with septal healing.

Examination. Cavanaugh (4) suggests that "compared with the general interest in the other sinuses, the attention given to the sphenoid sinus is slight, due, maybe, to the fact that it is harder to reach and examine. It is of greater importance due to closer association to vital structures and when affected is more liable to complications."

Loeb (5) says "that we do not know why the sinus should escape infection when every necessary condition is present so far as our knowledge goes; at any rate the opportunity is abundant, the attack is rare." It is a question whether the attack is really as rare as this would indicate. Surely the incidence of the chronic cases does not coincide with infrequency of acute infection. The violent or obstructed cases fortunately enough are rare, but the mild and moderate cases are common.

The history of these cases, together with the negative findings in the anterior two-thirds of the nose has been of greatest value in the diagnosis. The tentative diagnosis may be made by a careful study of the clinical course and by elimination of the sinuses of the anterior series.

Cavanaugh states his indications for a careful sphenoid research to be postnasal dripping, obscure cases of tinnitus aurium, headaches, obscure Eustachian tube infections, post auricular pains without special local findings, pressure back of the eyes and tenderness of the eyeball. He also suggests that, "It is possible that many disorders of the pituitary body are secondary to a primary disturbance of the sphenoid sinus. Dr. Cushing in his book on *The Pituitary Body and Its Disorders*, states that it is not unusual for patients to mention an occasional unexpected and intermittent discharge of mucus in the pharynx. Dr. Cushing would lead one to infer that this is the result of the diseased gland but it is a question whether the sinus pathology may not precede."

Anterior rhinoscopy is usually of no conclusive value. Especially is this true if the septum is deviated to any extent and the middle turbinates more or less crowded. Occasionally the mucosa in the region of the anterior sphenoidal wall may be seen and redness, swelling or discharge noted. In the wide open nose such inspection is relatively easy though the incidence of sphenoid disease is correspondingly less frequent.

Posterior Rhinoscopy with particular attention to the lateral folds of the pharynx and vault of the nasopharynx, gives more

evidence of value, especially after the sinuses of the anterior series have been excluded. In particular the *nasopharyngoscope* (Holmes) is of greatest value. By cocainizing the inferior meatus only, the nasopharyngoscope can be freely used and yet the suspected field not altered by the medication. By this means pathological hyperemia, edema, mucus, mucopus, pus or polyoid degeneration can be detected, especially if several observations are made at different times of day and at intervals during the same visit. One very marked and frequent finding is the irritative thickening of the septal mucosa opposite and extending down from the sphenoethmoidal angle. If only one method of examination were permitted the nasopharyngoscope would be the one of first choice. We have not tried the hand burr as suggested by Grayson (6) as the repeated use of the nasopharyngoscope has given the equivalent diagnostic information.

The X-ray examination has not been of great dependability in these cases. This is due partly to the difficulty of separating the sphenoid sinuses from the posterior ethmoid cells in roentgenologic study. A greater factor, however, is the likelihood of no alteration in the density of the tissues to the X-ray.

Loeb (5) states that "roentgenography has so far been of little value in the diagnosis of sphenoid empyema."

Iglauer (7) has found that "the roentogram is a great aid to diagnosis and should be combined with careful clinical study." In this he agrees with Law (8) who says, "It is necessary to know the history, symptoms, and the clinical findings before attempting a diagnosis."

Jersey (9) also agrees that "as a matter of preference I would not be without its aid, for it often adds weight to the positiveness of the diagnosis." In a case of primary tuberculosis of the sphenoid Kernan (10) reports marked clouding.

Shambaugh (11) reports that "transillumination and the X-ray were of no particular value in the diagnosis of sphenoid sinus trouble in an acute case," but in an abscess of one sphenoid sinus "the evidence was of definite value."

Cavanaugh probes the ostium, dilates with bougies and then uses a small transilluminator. The most he expects from transillumination, apparently, is anatomical information.

The examination of the fundus is always to be made though only of corroborative value. There is nothing pathognomonic nor constant. After studying a considerable number of proven cases, Dr. L. V. Stegman epitomizes the fundus findings as follows: "Some-

times the picture is that of a mild optic neuritis. The disc is usually slightly blurred, the margins of the papilla and retina "fusing." The vessels show only slight change if any, the veins being slightly darker and broader and maybe a trifle tortuous. There is also contraction of the color fields, especially for red and green, and the blind spot may be a trifle enlarged."

Other Treatment. Most of these cases being essentially chronic have had previous treatment and many of them have had nasal operations. For a long time we have tried various methods such as vacuum treatments, corrective surgery to the septum and turbinates, vaccines, general therapeutics, as regulation of the diet and of the gastro-intestinal tract and other measures looking toward the improvement of constitutional vigor. Cases which do not show marked improvement within a few weeks are unlikely to yield short of sphenoid surgery. Some cases have been advised climatic change and in the milder ones where the other nasal pathology has already been corrected this has been very satisfactory. In some cases, however, the return to the northern climate with the changeable seasons has been followed within a relatively short time by a recurrence of the annoying symptoms. In some of the catarrhal cases where a definite diagnosis of sphenoid disease could not be made, the surgery has been confined to the correction of septal and turbinal pathology. Turbinates that have been in contact with, or in close proximity to marked septal deviation, have been thus relieved from such a relation. The vicious circle of turbinate hyperemia and edema, irritating pressure against the irregular septum and retained secretions has thus been broken. In the course of a few months the condition of the turbinates has been wonderfully improved. With this the irritation in the spheno-ethmoidal angle has subsided. Whether or not these were true cases of sphenoid sinus catarrh is not easy to say.

Summary.

During the past year fifteen cases have been found where the sphenoid pathology and the irregularities of septum and turbinates have seemed to indicate this operation.

In those cases where septal irregularity intervenes this can be corrected and the further work on the sphenoid sinus adds but little to the operation. If a radical operation should be done later the septal work of the first operation would be a help or step toward the second.

The pathology of the middle turbinates is corrected and yet the turbinate preserved. No functionally necessary tissues are destroyed.

The technique permits of free inspection of the depths and angles of the sphenoid sinus.

The anterior wall and especially the lower angle may be removed freely and recovery thus insured.

In the nose with straight septum and a free view either the conservative operation of Skillern or possibly an exploratory opening as suggested by Grayson is indicated. Skillern points out, however, that some cases otherwise suitable for the conservative operation may not be done when the anatomy of the septum and superior turbinate results in a mere slit. Such cases would not contraindicate the submucous sphenoid operation, but rather would be entirely suitable for the same.

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THE ETIOLOGY AND PATHOLOGY OF LOSS OF VISION FROM THE ACCESSORY SINUSES.

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So far as can be determined, from discussions with men having to do with these borderline cases, the opinion almost universally held is that accessory sinus blindness presupposes purulent infections.

To illustrate:—In a recent conversation with a noted cerebral surgeon who has given this subject considerable attention, he expressed his conviction that if loss of vision ever resulted from the sinuses it would only occur when they were most evidently diseased.

When mention is made of opening them for the relief of blindness, the first question almost invariably is,—"Did you find pus?" While cases have occasionally been reported of loss of vision from non-purulent infections, this old belief of the necessity of finding pus is so persistent that it warrants reconsideration.

Etiology.

The earlier writers dwelt largely on the anatomical relations of the optic nerve and gave undue emphasis to the theory that purulent infections in the sinuses spread to the optic nerve because only a very thin bone intervened.

Gradle's views of the etiology of blindness show a beginning reaction from this idea. He says:—

"I believe that I am justified in stating" (contrary to the teachings of Onodi and Loeb) "that the anatomic relations of the sphenoid and ethmoid cells to the optic canal are immaterial when it comes to a question of optic nerve involvement in accessory sinus disease. The trouble is transmitted by the soft tissues alone."

In my first cases I expected to find the sinuses filled with pus, but this happened so rarely that it only helped to explain the etiology in but a few cases.

I did not at that time realize how difficult it was to determine histologically just where the dividing line was to be drawn between suppurative and non-suppurative conditions. Even when pus had been previously seen in the nose, it was found to be extremely

difficult to detect it during the operation mixed as it necessarily must be with blood. In not a few cases where pus was not seen either before or at the time of operating, the slides would frequently show dead cells, detritus and cocci in the lymph channels.

When Sluder's masterly work appeared I thought hyperplasia might explain the etiology of many cases, as it probably does when extreme. But it has not been my good fortune to find enough macroscopic hyperplasia to warrant it being considered the *principal* cause for the loss of vision. Nor did the sections, when viewed under the microscope, show changes sufficient to so consider it, although Dr. Jonathan Wright aptly says on this point:

"Are you or is any man in a position to state definitely just how much tissue change is sufficient to cause impairment of vision? I am sure I never was. I think it reasonable to suppose that is more or less dependent on locality, individual configuration of the nasal chambers and the sinuses and many other factors not forgetting the general one which is systemic and undefinable. No factor, not even 'tissue change' or obstruction is ever the sole etiological factor in any disease anywhere."

Being, then, at a loss to explain the etiology I went carefully over my cases and discovered that the one almost constant finding was enlargement of the turbinate tissue adjacent to the sphenoidal ostium. It was also quite usual to have a posterior deflection of the septum crowding the already poorly ventilated regions of the posterior sinuses. Then, in operating, the superior turbinates were generally found to be markedly enlarged and it was necessary to take out more tissue than one would have thought necessary from previous inspection, before good exposure of the wall of the sphenoid was obtained.

While Onodi did not recognize the full importance of blocking to ventilation and drainage, he has this to say in his explanation of the importance of pressure by the large cystic turbinates:—

"The so-called bone cyst is a structural anomaly known as the turbinate cell. Diseased, these turbinate cells may attain various sizes. They appear in the superior and middle turbinates, and as the turbinate cell of the superior turbinate, according to our observations, may be in close relation to the optic nerve, it will be seen that the practical importance of the turbinate cell is due to pathologic changes and growth, specially through pressure.

In cases under our observation the turbinate cell appeared nine times in the middle and twice in the superior turbinate; the turbinate cells twice opened into the middle meatus, at other times in the superior. Its length varied from 8 to 20 mm. the width from 5 to 14 mm., the height from 7 to 16 mm."

Thus, in reviewing my cases it seemed that the only consistent explanation of the etiology, applicable to most of the doubtful ones was to be found in the size and position of the middle and superior turbinates.

To Summarize:

In the last 22 cases mention was made in reporting them of obstruction by the middle turbinate in all but two. In the first ten it was mentioned but five times, as little of importance was at first attached to it.

Thus, the frequency with which these middle and superior turbinates have been found hypertrophied and most evidently blocking the posterior sinuses suggested the following theory as to etiology, in many cases where pus cannot be detected and the roentgenograms are practically negative. While it may be premature to present this theory without more data than I have been able to secure, it is done to obtain your views as to its plausibility and to solicit your co-operation in accumulating proof of its correctness.

The theory, in short, is that these superior turbinate structures high up in the roof of the nose, gradually become enlarged and obstructive. There is an increase in the basal connective tissue, i. e., a certain amount of hyperplasia, so that eventually the posterior sinuses are practically blocked. Then some infection takes place in these sinuses which, if not already occluded by the hypertrophied turbinates, most readily become so by a very slight increase in their size. Thus a low grade inflammatory process commences, generally of the exudative but non-suppurative type, the swelling and infiltration incident to it spreads by continuity of tissue to the optic nerve, or if the sinuses are completely shut off, there may be a closed empyema with infection to the nerve through the circulation,—not in all cases of course but in those which, through some anatomical peculiarity, are rendered especially vulnerable. The infection may be confined to the region superior and posterior to the middle turbinates, thus explaining why so little is seen on inspection and why roentgenograms show but slight, if any, changes, i. e., only what would be expected from an acute non-suppurative inflammatory process. The examiner should visualize these conditions somewhat, as it is not possible by any method of description to tell exactly how to determine these turbi-

nate abnormalities. It is comparable to the difficulty of expressing to others why in palpating the two mastoids the skilled otologist can tell that the one is filled with pus, with cellular structures broken down, and the other normal. It is simply the little edema that to the experienced examiner means so much, and yet it is so slight that only by long practice can one be reasonably certain of his diagnosis.

In my efforts to state a simple understandable theory it is impossible to consider the manifold variations and the many exceptions that one is bound to meet in these cases. Nature is complex but the mind of man seeks repose in a simplicity of cause and effect which does not usually exist.

As to whether or not the damage to the optic nerve occurs secondary to involvement of the sympathetic system in this region, as Dr. W. H. Haskin believes, I am unable to say. His theory seems a good one and the following is quoted:—

"The fibres of the carotid and cavernous plexuses are in intimate contact with these areas (diseased cells or sinuses) and they are the vasomotor and trophic nerves, the pupil dilating nerves and those which control the unstriped muscles of the eye and the orbit and they all belong to the sympathetic nervous system."

Pathology.

Having meditated much upon the pathology and discussed it, or the lack of it, not a little with many of my confreres without especially satisfactory results, the conclusions I have drawn are so similar to those in the following paragraph that I will quote it:—

"Sidepaths in Medicine" by Jay Perkins, M. D., Providence, R. I. "The study of pathology is an absolute necessity to one who would have a knowledge of medicine, but if we get into the habit of thinking a disease must present the pathology as taught and seen in the autopsy room before we make a diagnosis of that disease, we are many times of very little use to the patient, because we fail to recognize the nature of their ailments while they are yet in a curable stage."

It is well to bear in mind that noses filled with polypi and pus rarely produce any effect on the vision. It is also well to remember that cases with multiple sclerosis, brain tumors and various constitutional conditions may incidentally have marked pathology in the nose, so that no matter how much one sees on inspection, other possible causes should always be considered. The classification I have tried to make is:

1st: Direct extension by continuity from the source of infection to the optic nerve;

2nd: Toxemia from some infective process.

3rd: Bacteremia or focal infection; and

4th: Hyperplasia.

The theory of *Direct Extension*, it seems to me, has never received the emphasis it merits. If it is the correct explanation of what takes place in a considerable portion of the cases, it helps to clarify this whole subject. Let me quote Onodi again on this point:—

"We have two accurate observations, made by Ortman and Hajek, who have established the cause of infection by way of the blood vessels and tissue continuity. * * *

In Ortman's case the body of the sphenoid and the membranes showed the presence of diplococci. This finding showed that infection of the meninges may take place by direct continuity. * * *

The case observed by Hajek showed * * * a diffuse, fibrous, suppurative, acute pachymeningitis interna, and leptomeningitis of the base and convexity of the brain with acute internal hydrocephalus, inflammation of the left ethmoid cells, edema of the mucosa of the maxillary sinuses. * * *

That infection may take its course through tissue continuity and the blood vessels has been proven, that it may make its way through the lymph vessels, along the lymph spaces of the olfactory nerves through the openings of the lamina cribrosa, is possible, but has not been, up to date, microscopically and bacteriologically confirmed."

The theory, as I conceive it, is that by direct extension an acute inflammatory infection originating in the posterior sinuses, rapidly extends by continuity of tissue to the sheath or even to the optic nerve itself. These infections are frequently non-suppurative with practically negative roentgenograms An obstructive middle turbinate, and only the posterior portion of that, may be all that is found.

Because it is not always possible to secure sections showing marked changes, many have questioned the possibility of the sinuses being a factor in any of these borderline vision cases. Why, they ask, do you get loss of vision with little or nothing to be seen in the nose and yet rarely any visual disturbances in those so evidently diseased? The explanation, it seems to me, is that in chronic cases nature usually walls off the eye, the optic nerve and, in fact, the body from the source of infection. With this walling off, the blood also acquires an antitoxic immunity. An antrum, a frontal or any accessory sinus may be filled with the most offensive pus and be lined with exuberant granulations,

yet the patient suffers but little, if at all. Toxemia or bacteremia may possibly result, but as a direct causative factor these nasty sinuses which we have all been looking for in acute visual disturbances, play but a minor role.

While Onodi did not seem to take into account this walling off process, he mentions that marked infections do not necessarily impair the vision.

In the chronic empyemas, nature generally throws out a barrier which walls them off from the adjacent structures, otherwise purulent infections in the sinuses and likewise in the mastoid, would more frequently invade the cranial cavity. While it is true that through some re-infection or a breaking down or erosion through this barrier there occasionally occur serious intracranial infections, these are of rather infrequent occurrence. The otologist well knows how important it is to await the formation of the barrier which separates the mastoid from the meninges and lateral sinus before he advises operative interference. While he may not be able to demonstrate pathologically what happens in these acute infections, he learns from his clinical experience that during the first week or ten days there is more or less general infection, frequently associated with hyper-pyrexia and accompanied by tenderness over and about the mastoid together with more or less pain. Then the mastoid becomes separated from the general system by this walling off process and although its cellular structure may be breaking down, the infection is practically a localized one and pain, tenderness and temperature usually subside.

This is comparable to what may happen in the accessory sinuses. When an acute infection occurs in the sphenoid or posterior ethmoid, there may be an almost immediate invasion of the tissue about the optic nerve, including the sheath of the nerve or the nerve itself. When, on the other hand, there is an infection in a more remote sinus, it fortunately becomes walled off before the optic nerve is reached. Should the infections, however, persist there may be poured into the system a certain amount of bacteria and toxins which may produce an optic neuritis, or, for that matter, a neuritis of any nerve.

What I especially desire to emphasize is that while sub-acute or chronic infections may be an occasional factor in involvement of the optic nerve, the acute infections with but little discoverable

evidence in the nose are of far greater consequence. The fact that it is so easy to overlook this condition leads me to dwell upon its importance.

In but few of my cases was there marked involvement of the sinuses, and in none was there offensive pus. The important thing to look for is obstruction to the posterior sinuses. In my first ten cases the nasal examination was reported negative in seven, while in the last seventeen some obstruction to drainage was found in all. It required these ten cases to teach me what to look for; and without doubt were they to be again examined I should not pronounce them all negative. Let me emphasize again that normal noses do not produce loss of vision. But in many, that on first inspection *seem* normal, there *is infection,* even if not evident. I think it may be stated in a general way that if the inflammation has simply produced pressure by a swelling about the nerve and has not involved the nerve itself, the prognosis is good; while if it involves the nerve (if there is a true optic neuritis), complete recovery is much less liable to take place. In the latter the sinuses should be drained and drained speedily.

For one should remember that the optic nerve is really not a nerve but a lobe of the brain. It is easily destroyed and does not regenerate. Parsons says of it:—

"The so-called optic nerve together with certain parts of the retina, constitutes a lobe of the brain, and has therefore the characteristics of the central nervous system. Hence the nerve-fibres are devoid of a sheath of Schwann and the interstitial substance is neuroglia."

In a conversation with Dr. Sluder as to the difficulty I was having in obtaining slides which showed much pathology, he told me how much help he had received from Dr. Jonathan Wright and suggested that I write to him, which I did, and his kindly letters have so many points applicable to this subject that I have asked his permission to make extracts, justly feeling that it would be selfish not to share the wisdom therein contained. In one letter written in reply to my inquiry as to the best methods of investigating the pathology, he says:—

"The reasons the general pathologist fails to recognize the basis of much nasal clinical manifestation, is that it frequently happens that the tissue submitted is too small for a definite opinion, or is from a locality not directly associated with the trouble—for instance, it not infrequently happens that the nasal surface of the sphenoid is fairly normal and that of the cavity, diseased—the tissue may be from the middle turbinate rather than from a sinus wall, etc. Chiefly, however, it is because the phenomena of physiological change are so confused with those of the pathological. There is considerable difference in

even the normal structure dependent on age and season or climate but next to the one I have emphasized, probably the most frequent practical difficulty comes from the ravage wrought in the process of getting rid of the bone salts to allow sectioning."

Possibly by comparing what happens to some of the other cranial nerves enlightenment may be gained on the pathology in these vision cases. There is a not infrequent paralysis of the facial nerve from some slight disturbance in the middle ear. This is generally known as Bells-palsy. Reik claims there is always a preceding non-suppurative middle ear infection, yet it is of such a slight or transitory nature that the drum membrane appears practically normal. The fact that both the facial and optic nerves pass through a bony foramen and are thereby rendered more susceptible to inflammatory affections, would seem to make this comparison of value. When there is an inflammation of the middle ear sufficient to cause a facial paralysis and yet not active enough to produce much, if any, change evident even through a *transparent* drum membrane, *why* expect to discover in the posterior portion of the nose a change *so marked* as to be evident through the *mucous membrane covered walls* of the accessory sinuses, not to speak of the difficulty of inspecting these walls owing to the presence of a middle turbinate? The middle ear may well be compared to the sphenoid, the Eustachian tube to the ostium. When closed an inflammatory process takes place sufficient in the one to cause facial paralysis, in the other blindness.

There is one other cranial nerve—the 6th—that occasionally becomes involved in an inflammation of the mastoid. This nerve also passes through a canal and although a fibrous one, it is just where the nerve is vulnerable.

Toxemia: It is conceded that retrobulbar and optic neuritis can be caused by alcohol, lead, tobacco, quinine, optochin, ethylhydrocuprein, arsenic, lues, etc., so that reasoning by anology there is little doubt but that toxins originating in the accessory sinuses, or for that matter anywhere in the body, may have similar action on the optic nerve. The onset is usually less violent than where there is a direct extension and is more apt to be a causative factor in chronic types. There is generally sufficient time in those subacute or chronic cases to make a careful differential diagnosis, and here roentgenograms may prove of great assistance.

In the thirty-three cases studied toxemia was considered the chief factor in eight. In four diseased teeth were extracted; and the antra opened in three.

It is quite generally conceded that any pus focus within the body may be a factor in these vision cases, and while this paper deals only with the accessory sinuses, other possible sources must not be overlooked.

Bacteremia: It has been demonstrated by Billings that infectious micro-organisms may be carried in the blood stream or by the lymph channels from the foci of infection in the teeth, tonsils and accessory sinuses to the terminal blood vessels in various regions of the body. He has shown how the inoculated blood vessels become more or less occluded by endothelial proliferation and leukocytic infiltration and that the bacteria escape through the vessel walls into adjacent tissue, so that there would seem little doubt but that bacteria within the accessory sinuses may also travel via the blood stream and lymph channels to the optic nerve. Why are we so greedy to accept diseased tonsillar crypts as a cause of arthritis of the great toe but so slow to accept the view of involvement of the optic nerve in a process so contiguous to it as accessory sinus inflammation?

Hyperplasia. By this is meant a functionless overgrowth of the supporting tissue. It has been greatly emphasized by several writers as a causative factor, and in the summary of one of my papers is given as the predominating lesion in 14 cases; but as it is found to be a common condition in the noses of most people subject to the sudden variations of temperature, it is so difficult to explain just what occurs that but few will concede to this hypothesis.

Hyperplasia as a predisposing factor is probably of considerable importance. It undoubtedly renders the accessory sinuses more vulnerable, as was mentioned in speaking of the new etiological theory. Hyperplasia *plus* infection and direct extension to the optic nerve is, it seems to me, of far greater importance than the mere fact that the tissue has become hyperplastic. In my fourteen cases I think it was the infection that caused the damage rather than hyperplasia.

As to the *modus operandi*, Beck believes that "in the early non-suppurative chronic form of sinus disease there results an engorgement of the optic nerve, edema and later reparative inflammation, contraction and destruction of the fine neural filaments." While no one knows what actually takes place, this is as plausible a description as any I have seen.

Whatever may be the true explanation of the pathology, it would seem at the present time advisable to recognize the clinical fact

that where no other cause for the neuritis can be discovered the opening of the accessory sinuses either by depletion or by ventilation, or by getting rid of some bacteria, generally proves beneficial.

Meanwhile any patient who has been thoroughly investigated should not be deprived of the benefits of this operation just because the bacteriology or pathology is not thoroughly understood.

Let me refer to Loeb's views along this line. In calling attention to the rapidity with which serious eye symptoms may disappear after appropriate nasal treatment, he says:—

"The ready recovery under the circumstances is as convincing of their nasal origin as anything could be short of autopsy findings."

While we have not been able to prove definitely to which one of the four classes each case should pathologically belong, enough evidence has been discovered to say pretty definitely that there is an infective process in the posterior sinuses which might readily reach the optic nerve, be it by direct continuity, by toxemia or bacteremia.

Let me here express my thanks and appreciation to Dr. Frederick H. Verhoeff, who in addition to referring several of these cases and giving me data in their eye conditions, has also spent much time on the preparation and examination of the specimens, smears and cultures.

Dr. Jonathan Wright very kindly examined the sections from the last nine cases operated upon, but as his report takes up each case in detail, only the first and last cases are embodied in this paper.

2.3739 Sept. 26, 1919 (Case 19).

"I should suppose some of this tissue surely came from an accessory cavity and some from the nasal chambers. The latter is an edematous and fibrous hyperplasia. As to the tissue from the sinus, as I suppose, this presents less edema and more fibrous hyperplasia, a thing in itself significant for the mucosa of a sinus. (I use the term fibrous hyperplasia from long habit as indicating a more chronic process than 'increase of the connective tissue' or 'a large number of fibroblasts', but perhaps that is not always a warrantable inference.) There is however without doubt chronic inflammation of the mucosa and I should say numerous bone areas were involved.

O. im 1/12—I think confirms this. It seems largely bone proliferation—I am referring only to the bone changes—but there can be no doubt these should be looked on as inflammatory, so marked is the fringing zone of osteoblasts and fibroblasts. Probably no such area of rarefying osteitis can be found here as is shown in the remarkable picture fig. 4, p. 21 in Sluder's book, but the state of a chronic bone inflammation is not the less unmistakable."

3.4118 (4 SLIDES) APRIL 6, 1921.

Case 32:

(a) "Left middle turbinate. Not much increase of new or old connective tissue,—in glandular areas very little, but here it is gorged with leucocytes and considerable serous effusion. Deeper there is fibrous hyperplasia and thickening of the periosteal layers and I should think the bone areas show an increase in thickness. There is apparently some cellular hyperactivity along the bone edges, but the definition is poor."

Old Chronic Inflammation with Acute Exacerbation.

(b) Another section shows rather marked subepithelial serous and leucocytic infiltration in another locality. Surface epithelium not much altered, otherwise as above.

(c) Post ethmoid. Very much more new connective tissue formation and a good deal of leucocytic infiltration with numerous lymphocytes. Bone shows up badly under high power, but I should think it at least somewhat—probably much invaded, a subacute inflammatory process more plainly evident in the soft parts.

(d) Sphenoid. Piece too small and bone unsatisfactory, but probably seat of inflammatory activity, *i.e.*, ragged edges and chromatin effusion,—cellular bone changes not shown.

Dr. Harrison L. Martland, Pathologist, of the Newark City Hospital, also examined my sections and dictated the following:

Most sections show intact mucosa, in many places it seems to be edematous and hyperplastic; submucosa varies all the way from normal to areas containing numerous small mononuclears, practically no polymorphonuclears, some sections show considerable number of eosinophiles, indicating low grade chronic infection.

Submucosa is often edematous, in some places there is questionable rarefying osteitis. Many sections show considerable dilitation of submucosal vessels (acute hyperemia) and undoubtedly represents low grade chronic inflammation, which is non-suppurative.

Conclusion.

It is quite possible in non-suppurative inflammation that edema of mucosa and submucosa with acute hyperemia of vessels, etc, may produce more pressure than a suppurative process, in which the pressure is often relieved by the breaking down of the tissues.

Case 30:

Miss R. P., aged 25, was referred by Dr. Verhoeff at the Eye and Ear Infirmary on February 18, 1921, with diagnosis of bilateral retrobulbar neuritis. History of influenza two months previously, was in bed two weeks and had considerable trouble with her head. Always subject to colds accompanied by pain in the back of head and above eyes. There was, however, no pain through the eyes with the above mentioned attack, but there was severe pain in the back of the head. The right eye was blurry almost with the onset

of the influenza and two days later the left eye was likewise affected. As far as the patient can tell the vision of 20/200 has remained practically unchanged since the trouble commenced. The fundi were negative except small pigment spots in the macular lutea and a striped appearance, probably not pathological. Visual field showed slight contraction. The pupil of the right eye was somewhat larger than the left. A deflection of the septum to the right posteriorly, crowded an enlarged middle turbinate and evidently blocked the posterior sinuses. The left middle turbinate was also moderately hypertrophied. The physical, neurological, Wassermann and dental examinations were negative. Dr. H. H. Vail went over the case carefully but found no evidence of any cerebral or cerebellar lesion. Dr. A. S. Macmillan made stereoscopic plates and reported that the ones under exposed showed slight haziness of the sphenoids. In the absence of other findings it was felt that the sinuses should be drained, so on February 24th a semi-radical sphenoid exenteration was performed on the right side. Smears and cultures were made from the sphenoid and numerous specimens saved for future study. The walls of the sphenoid were pinkish and somewhat thickened and suggested a recent inflammatory condition. The patient was apparently not benefited by this operation. Three weeks later she was thoroughly re-investigated and a lumbar puncture done, but the findings were practically negative. Dr. Alexander Quackenboss, who later examined the eyes, reported that there was a suggestion of an old iritis on the right, i.e., a ring of deposit on the anterior capsule. He offered the suggestion that the loss of vision might be due to some focal infection, such as teeth or tonsils. The teeth appeared negative both from films and on inspection, so the tonsils, which seemed somewhat enlarged, were removed but no pus or special pathology was found. Following the lumbar puncture the patient was confined to bed for two or three weeks with very severe pain throughout the head. This pain entirely disappeared after the removal of the tonsils. Although the patient could not apparently read the chart better at the time of discharge than when she entered the Infirmary, she could, when ordered to do so by Dr. Verhoeff, read ordinary book print, so he was inclined to think there was an element of hysteria in this case.

As to whether earlier drainage of the accessory sinuses would have proven beneficial, it is impossible to state. Cases of two months duration, as was this one, do not respond as readily as those of short standing. These cases are followed for months or even years, so it is hoped that some future developments may throw light on the etiology. The cultures from the sphenoid showed one or two colonies of staphylococcus albus. From a report on the sections taken from the middle turbinate and sphenoid see Dr. Wright's interpretation. A recent letter from the patient says that the vision remains the same although the general health is much improved.

Case 31:

Miss J. I. B., aged 27, was referred by Dr. Alexander Quackenboss on March 15, 1921, with diagnosis of optic neuritis, right. History of fair general health, but was rather tired. Had double pneumonia four years ago, since which period has been subject to colds and has had one for the past four or five days. This was accompanied with pain about the eye which has

increased in severity so that when seen she looked extremely ill. Eye was sensitive to light and on movements and pressure. Vision when first seen was 20/20. The right middle turbinate was somewhat enlarged and the septum bent slightly to that side. No secretion was seen within the nose, but there was a marked pharyngitis with considerable tenacious mucus. Transillumination was negative. The patient was referred to the Eye and Ear Infirmary for investigation and the sinuses x-rayed by Dr. Macmillan, who reported:—"Frontal sinuses undeveloped; ethmoidal region quite cellular; right slightly clouded, especially posterior group; sphenoids moderate size and well anterior to sella appear clear; antra are both large and clear." The physical, neurological and Wassermann examinations were all negative. Films of teeth showed infection about one which was extracted some three weeks later. On March 17 Dr. Vail examined the patient and found the vision 20/40 with central scotoma for colors. The following day she was seen by Dr. Quackenboss who found considerable increase in the neuritis and vision 10/100. There had been severe pain about the eye for the entire week and it was still sensitive to pressure. In view of the negative neurological examination, the rapidly diminishing sight and the increase in the inflammation of the optic nerve, it was deemed advisable to open the accessory sinuses. The patient was accordingly admitted to the Infirmary and on March 18th, under general anesthesia, the right middle turbinate was removed, the sphenoid opened and the posterior ethmoid uncapped. The tissue was somewhat inflamed, but no pus was seen. The lining wall of the sphenoid was little, if at all, changed. Cultures and smears were made and specimens saved for study. On the day following the operation the patient felt considerably relieved and the eye was less blurry. This lasted but a few hours, then there was a rapid recurrence of the blurring and the vision continued to fail, so that a week after operation fingers could be made out only at three inches. Dr. Quackenboss examined the eyes four days after the operation and reported edges of disc practically obliterated, some exudate; Small blood vessels engorged; no marked swelling or papilloedema; no hemorrhage. Two weeks after operation the swelling in the nose had subsided and the patient was much better; discomfort and blurriness alleviated; counted fingers at eight feet; four days later fingers at twenty-five feet and vision was 20/80. On April 15th, Dr. Quackenboss examined the fundi and reported blurriness practically disappeared and outline of disc sharply defined. April 25th the vision was 20/60 On April 29th Dr. Quackenboss again examined the eyes and noted slight pallor of the disc. The smear from the sphenoid showed only blood and a few epithelial and pus cells. In one of the culture tubes there were three colonies of diphtheroid bacilli. The specimens from the middle turbinate and sinuses were examined by Dr. Wright. See his report.

Case 32:

Mrs. H. G., aged 24, referred by Dr. H. B. C. Riemer at the Infirmary on March 16, 1921 with diagnosis of bilateral retrobulbar neuritis. History of frequent headaches, otherwise negative. Present illness:—Following a severe cold 4 weeks ago there was a sudden loss of vision in the left eye and 2 days later in the right. This was associated with pain on moving the eye and sensitiveness to pressure. When seen a week or ten days ago by Dr. Riemer

there was considerable swelling about both discs and the vision was practically the same as on admission, i. e., 20/70 right and fingers at 2 feet left. Fundi examination showed that the edges of the discs were not entirely lost or obliterated. The lower outer edges were quite distinctly made out. Upper portions indistinct with some pallor. Slight enlargement of the fine capillaries. Physical, neurological, dental, Wassermann and spinal fluid examinations negative. The septum was badly deflected high up with enlarged middle turbinates in close contact with it. Pus above the right middle turbinate and below the left. Dr. Macmillan reported as to the X-rays:—"Both frontals small and clear; left ethmoids definitely clouded, right ethmoids clear. Both antra clouded, probably thickened membrane. Teeth show no evidence of apical involvement. Teeth in good condition." Dr. Vail went over the patient neurologically and found no evidence of any cerebral or cerebellar lesions. As the eyes had not improved during the past week and there was a slight pallor noticeable, it seemed urgent that the infection should be relieved, so on March 23rd under general anesthesia a submucous resection of the septum and a bilateral semi-radical sphenoid operation were performed. The sphenoidal mucosa appeared practically normal. Smears and cultures were taken and specimens sent to the laboratory for study. The smears were chiefly blood. Five cultures from the sphenoid showed 1 to 3 colonies each of staphylococcus albus. No pus was seen during the operation. Patient improved rapidly, so that when discharged a week after the operation the vision was 20/70 left and 20/40 right. On April 29th the fundi were examined and the edges of the discs were found to be sharply defined but there was slight pallor of the entire discs. Vision without correction 20/30 both. See Dr. Wright's report on specimens removed from turbinates and sinuses.

Case 33:

N. C., aged 24, was referred by Dr. Verhœff at the Infirmary on April 29th, 1921, with acute unilateral retrobulbar neuritis. Patient in good general health. Has had several operations on nose and throat. Tonsils were removed last November and septum resected last January. Has had considerable secretion in throat and blowing of nose. No recent cold. On April 10th, on awaking he noticed that things seemed blurry when viewed by left eye. This grew rapidly worse so that in 2 days he did not even have light perception. Four days later the vision returned somewhat so that he could count fingers at 5 or 6 feet, but since that time it has been stationary. Dr. Verhœff on examination noticed distinct pallor of the left disc. Eye sensitive when moved up or sideways, and there is a sense of discomfort back of eye. There was a moderately high posterior deviation of the septum to the left which was in contact with a hypertrophied middle turbinate. There appeared to be considerable obstruction to the drainage of the posterior sinuses on the left. No secretion was seen. Transillumination negative. Naso-pharynx showed marked reddening with thickened glandular areas scattered over it. Medical, neurological and Wassermann examinations negative. Visual fields showed a marked central scotoma and some contraction. Massachusetts General Hospital reported that there was no other cranial nerve involvement. Dr. Vail ruled out cerebral and cerebellar lesions. Dr. Macmillan reported on X-ray of the sinuses as

follows:—"Posterior ethmoids both sides are definitely clouded, sphenoid does not appear to be quite normal. Antra and frontals do not appear to be affected. Teeth:—abscess about roots of right lower second molar." On May 3rd the patient was operated upon. It was found that the upper posterior portion of the septum which appeared twisted had not been resected. This was accordingly done by Dr. Vail. The resection extended back to the front wall of the sphenoid as it was otherwise difficult to obtain a good view of that region. The middle turbinate was removed. The front wall of the sphenoid broken down and the posterior ethmoid cell uncapped. Various sections of the sphenoid and posterior ethmoid were preserved for study. Smears and cultures were made, one on liquid blood serum in an endeavor to grow the streptococcus viridans. The lining membrane of the sphenoid appeared normal. No pus was seen. Within 48 hours the discomfort about the eye and sensitiveness to pressure had entirely disappeared. Fogginess less dense. Not very marked reaction from operation. Vision fingers at 12 feet. Two days later patient had a temperature of 103° and the lateral wall of the throat showed some redness. This was followed late in the afternoon by a severe hemorrhage from the left side of the nose which was not controlled until the posterior nares and nose were firmly packed for 24 hours. Two days later the patient developed acute middle ears and it was necessary to incise both drum membranes. The slight infection in the nose subsided rapidly and although it was necessary to reincise the drum membranes, the patient went along favorably.

Cultures from the sphenoid showed 2 colonies of staphylococcus albus on solid media. A few short chains of streptococcus in water of condensation in addition to abundant staphylococcus in blood serum. The patient is still under observation. On May 31st, 1921, fingers could be made out at 20 feet.

SUMMARY.

Etiology.

Earlier writers considered the anatomical relations of the optic nerve to the accessory sinuses the chief factor. Later ones claimed the trouble was transmitted by the soft tissue. No one etiological condition responsible for all cases. Purulent infection accounts for a few, while hyperplasia seems of minor importance. The size and position of the middle and superior turbinates probably explain the etiology in a large number. Poor ventilation and faulty drainage are all important predisposing factors.

Pathology.

Sub-divided into four parts:

First—Direct extension.
Second—Toxemia.
Third—Bacteremia.
Fourth—Hyperplasia.

First—By direct extension acute infections in the adjacent sinuses spread by continuity of structure to the sheath of the nerve, or even to the optic nerve itself, while in the more remote sinuses the infection becomes walled off. Nature has also walled off the chronic infections so that it is futile to longer believe purulent sinus disease the one and only etiological factor. Cases with sudden loss of vision presenting such noses might better arouse suspicion that the cause should be sought elsewhere than longer be considered the sine qua non of accessory sinus blindness. Similarity between optic neuritis and Bell's palsy.

Second—Toxemia. Toxins originating in the accessory sinuses or elsewhere may involve the optic nerve.

Third—Bacteremia or focal infection. Microorganisms may be carried in the blood stream or lymph channels from the foci of infection in the sinuses to the regions adjacent to the optic nerve. Hematogenous focal infection of the nervous apparatus has been demonstrated, so why not a similar involvement of the optic nerve?

Fourth—Hyperplasia. Probably as a predisposing factor a considerable importance but not per se. Hyperplasia plus infection and direct extension to the optic nerve responsible for many cases.

Cultures when taken all gave some growth, principally the staphylococcus albus. A few streptococci were found but the viridans were not isolated. Several of the sections showed considerable increase in the leukocytes and fibroblastic tissue along the margins of the bone. Others showed chronic inflammation of the deeper elements of the mucosa and of the bone, while a few showed fibrous hyperplasia.

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THE COMPLETE SPHENO-ETHMOID OPERATION.

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In a number of recent articles on the subject of ethmoid operations as well as in private conversation there appears to me to be some dissatisfaction with the eventual outcome of these procedures. This has not been my experience; on the contrary, it has always seemed to me that the spheno-ethmoid region was the easiest of all the paranasal spaces to rid of its inflammatory process. A review of the cases in my private practice shows that 80% have been completely and permanently cured. By the word cured I mean that the patient is entirely free from symptoms of any kind, subjective or objective; that he requires no treatment whatever, neither at home nor at the hands of the physician; and that this happy state of affairs has persisted for at least one year, and has continued to the present time. The oldest case is that of a man who for years had suffered from numerous large nasal polypi and nasal discharge, and who has been completely and continuously well during the past ten years.

These results seem to me to be most encouraging and as they can only be due to the principles which I have endeavored to follow, and to the manner of carrying out these principles, i. e., to the technic employed, and as these differ in some respects from those described in the text books and other literature, I feel it incumbent on myself to present them for your consideration.

The principle of the first importance is that of the completeness of the operation. That is to say, whenever there is an indication to open even a single ethmoid cell, all the cells are opened at the first operation, from the infundibular cell to the sphenoid, from the supraorbital cells to the cells of the bulla and uncinate process. To open a single cell, or even a group of cells, without opening all of them, is a practise which I have entirely abandoned long ago. There are anatomical and clinical reasons for taking this standpoint. (1) The arrangement of the cells in particular groups is not anatomically constant. (2) In operating even on the cadaver, it is impossible to determine when all the anterior ethmoid cells have been entered without opening a single cell of the posterior group. In the living patient it is quite impossible to open the posterior ethmoid cells without removing some of the

anterior cell walls. It is never possible to remove the entire anterior sphenoid wall without having first entered the posterior ethmoid cell. It is therefore anatomically impossible to be sure of having opened all of the cells of one group and at the same time be sure of not having opened any of the cells of another group. (3) Clinically it is not possible to determine the exact number of cells involved in the suppuration even with the help of the most skillful radiographer. For I have repeatedly seen cases in which a single anterior ethmoid cell and a single posterior ethmoid cell were suppurating, while all of the intermediate and surrounding cells were entirely healthy. (4) It has been my clinical experience that whenever I have opened a single group of cells only, the rest of the spheno-ethmoid labyrinth had to be opened afterwards. For both the adsorption of the pus to the mucous membrane and the capillary attraction in the narrow respiratory channels, defy the laws of gravitation, and during the reaction from the traumatism the unopened cells have become infected. I can say truthfully that I have usually regretted having opened only a few cells, but that never in a single instance have I had any reason to regret having opened all of the cells at one sitting. In this respect the spheno-ethmoid region may be compared with the mastoid region. There was a time when otologists were satisfied to make a small trephine opening into the mastoid cortex, and leave the rest to take care of itself. Some of the patients recovered, but it soon became evident that to cure the largest number in the shortest time, only a complete operation would suffice, even if most of the cells were free from pus. I am neither the first nor the only one to advocate a complete operation, but partial and incomplete operations are still performed by many eminent rhinologists. It is my opinion that such operations are of no more benefit to the patient than an incomplete mastoid operation; that they should be abandoned entirely, and that no operation should be considered permissible which leaves a single cell in the entire spheno-ethmoid region unopened.

The second principle, not less important than the first, is the necessity of carefully preserving the mucous membrane lining the interior of the cells. For (1) we can not too often remind ourselves that the mucous membrane of the nose is not merely the lining of a hole through which we breathe, but that it is an organ with a definite physiological function, with anatomical and histological parts distinctly differentiated for the purpose of exercising this function. When the mucous membrane has been re-

moved from the entire spheno-ethmoid region, a surface of bare bone of considerable area is left which can heal only by granulation and epithelialization, the end result, when it is finally accomplished, being a large irregular cicatrix covered with squamous epithelium, which exercises no function and which offers but little resistance to subsequent infection. The conservation of function is of special importance in the region under consideration; for the middle meatus is the main respiratory channel, through which the greatest part of the inspiratory air passes. The demands made upon this region are greater than upon all the rest of the nose together. To remove the entire diseased organ may be one way of terminating the disease; but it is not the way to cure the patient. (2) Even if the mucous membrane of the interior of the cells is diseased, is it *necessary* to remove it? When the cells have been freely opened the conditions for a return to normal are vastly improved. So frequently and with such regularity have I seen the grayish edematous polypoid patches of mucous membrane return to a smooth pink healthy looking mucous, that I have come to regard such an outcome as the rule.

(3) The removal of the mucosa of the cell interior does not serve any really useful purpose; for if the object of removing it be to remove the infected mucous membrane, a most absurd blunder is being committed. For if the mucosa of the cell interior is infected, then surely the mucous membrane of the rest of the nose, for instance that of the septum, which is continually bathed in the pus from the cells, must also be infected. Therefore only a part of the infected mucous membrane is removed by the operation. If it be argued that the nasal mucosa is able to throw off that infection because it is free and exposed, then the mucous membrane of the cell interior will also be able to throw off the infection, as soon as it also has become exposed by opening the cells.

(4) There is another excellent reason for leaving the mucous membrane of the cell interior in its place. The dura of the cranial cavity and the periosteum of the orbit are in direct continuity with this lining mucosa by means of blood vessels and nerves which pass through openings in the bony walls, some smaller and some larger. There are also occasionally dehiscences in the bone when the mucous membrane is forcibly torn out, minute injuries are caused in these important structures, through which infection can travel with the greatest ease, not only at the time of operation, but during the entire course of the healing

process. This danger seems to be entirely obviated when the mucous membrane is left in place; at any rate in the cases which I have operated there have been neither intracranial nor orbital complications, and there have been no deaths.

(5) Finally the healing of the wound is enormously delayed by the removal of the mucous membrane. The site of the wound is always infected, and the bone does not granulate uniformly. The granulations easily become exuberant, and overlie the bare bone, so that it not infrequently happens that the convalescence is interrupted by the necessity of curetting fistulous tracts at the bottom of which bone is discovered, which was not found at the time of the original operation, because at that time the bone was healthy.

The situation is quite different when the mucous membrane has been left in place. Not only is the danger of complications reduced to a minimum but as the area of bone which must granulate is only that represented by the edges of the partitions between the cells, this process is much more quickly completed and epithelialization takes place rapidly between the adjacent edges of the remaining mucosa over all parts of the wound. Secondary operative procedures are rarely needed, and the tendency of the larger cells to close until there is only a pin-point opening is entirely prevented. The mucous membrane itself, which at first is infantile in character, soon assumes the texture and consistency of adult mucous membrane, and begins to carry on its function, greatly to the well-being and comfort of the patient.

The operation consists of two parts, which are of equal importance. The first part is the operation itself, which is usually completed within an hour; the second part is the after treatment, which is divided into two periods. The first period is the time taken for the wound to heal; this is usually completed in about six weeks. The second period is the time required for the complete restoration of the function of the nasal mucosa; this takes at least one year.

In order to insure a satisfactory termination of the entire procedure, it is necessary to perform all the operative manipulations with the utmost precision, the bleeding during the operation must therefore be reduced to a minimum. For this reason I have performed all my operations intranasally and under local anesthesia, the patient sitting upright or in the semi-reclining position. With the patient lying down and especially under general anesthesia, it has been my experience that the congestion of the head is so

great that adrenalin does not blanch the tissues or control the bleeding.

When the upper part of the nasal septum is deviated toward the side of the operation, a resection of the septum is advisable as a preliminary procedure. When the disease is bilateral, with a deviated bony septum, the wider side is operated first, then the septum is resected, and finally the other side is operated. It is often possible to push the deviated septum aside by means of a long bladed speculum; but it always returns to its original position, and the swelling following such a traumatism has so often caused synechiae to form in this region that I have abandoned this practice.

Anesthesia is obtained by spraying a solution containing 10% of cocaine and 1 to 2000 adrenalin into the upper part of the nostril; if compressed air of 25 pounds pressure is used the solution will be driven into the deepest recesses; but if necessary, subsequent applications can be made. A thorough toilet of both nostrils is of course necessary.

The first step of the operation is the removal of the entire middle turbinate, with the Holmes' scissors and the snare. Special attention should be given to the posterior end, which is often a pendulous mass of soft tissue of considerable size.

The opening of the cells is accomplished entirely with punch forceps. There are three kinds of forceps. (1) Forceps with flat serrated jaws, the "dressing forceps." (2) Forceps with jaws hollowed out, which meet edge to edge; they were originally called double curettes. (3) Forceps whose jaws are so constructed that the blades pass each other, the one blade passing through the second—these are the punch forceps. The curette is never used, not even for the purpose of opening the cells. The curette can not cut through the soft parts except on the side of the bone nearest the instrument. On the distant side it only tears the mucous membrane and separates it from the bone. It is always my object to preserve the mucous membrane which remains in the nose and to preserve its normal attachment to the bone, which can not be done when the curette is used. Besides, the curette invariably leaves shreds and tabs of mucous membrane and pieces of bone, which must afterward slough off. For these reasons I have discontinued the use of the curette entirely. The same applies to all other instruments which have only one cutting blade.

Only such forceps are used in which the cutting edges of the blades extend back to the joint; forceps which can button-hole the parts are avoided. The most practical instruments are those in which a variety of cutting heads, each attached to its own shank, can be inserted into a universal handle; the head can be placed in a variety of positions, thereby lessening the number of instruments required.

It is of the utmost importance that the punch forceps should be exceedingly sharp. If they are dull, the mucous membrane is not entirely cut through and when the forceps are removed from the nose the mucous membrane is torn away from its attachment to the bone. I have seen the mucous membrane of an entire ethmoid cell torn out in this way, and the removal of the mucous membrane from a single ethmoid cell will delay the healing of the wound fully six weeks. The forceps can be tested by cutting moistened tissue paper, which they should cut clean. If necessary they must be sharpened. This can be easily done by turning over the edge of the blades with a hard steel burnisher. I consider this a matter of such importance that I invariably give it my personal attention before each operation.

The cells are easily penetrated by the blades of the forceps. I have devised a special forceps with trocar-pointed jaws for this purpose, but they have not proven especially advantageous except for entering the sphenoid when the natural orifice is small. It is immaterial whether the opening of the cells is begun in the anterior or the posterior group, the most prominent cell being the one selected. From this point the opening of the cells proceedes in a backward direction until all of the cells of the posterior group and the sphenoid cell have been opened, their entire inner walls and the partitions which separate them being completely removed and all converted into one single cavity.

The object of attacking the sphenoid at an early stage of the operation is as follows: There are four landmarks by which I have been accustomed to determine the limits of the spheno-ethmoid region, and to decide when all of the cells have been opened. The first of these is the roof of the posterior group of cells and the sphenoid is included in this group. It is immaterial whether the sphenoid or a large posterior cell is the highest of the group, if a line be drawn between the highest points of the roof of two or more cells of this group, this line when continued forward will pass through the roof of all of the highest layer of

cells. In this way the floor of the skull is identified at an early stage of the operation.

The second landmark is the posterior border of the nasal process of the superior maxilla. The rounded border of this process can be located just above the lower turbinate, about one half inch behind its anterior end. If the line of this border be continued upwards, it marks the anterior limit of the field of operation. Sometimes this line passes through the anterior end of the middle turbinate; at other times it passes in front of this point. In the latter case a large infundibular cell may be expected. When the posterior group of cells has been opened, the anterior cells are opened from behind forward until the anterior limiting line has been reached.

The line passing through the roof of the cells and the anterior limiting line, meet in the upper and anterior part of the nose. At this point will be found the opening of the frontal sinus, which constitutes the third landmark. If all the anterior cells have been opened and their partitions removed, a probe passed into the frontal sinus will be found to be freely movable in all directions, and its shank will lie close to the anterior limiting line; for, if the cell walls have been completely removed, the naso-frontal duct will have been converted into an open groove. On the other hand if the probe, in order to enter the frontal sinus, must be introduced at a point half an inch or more behind the anterior limiting line, and if, when introduced, it is nearly fixed in position and not freely movable, then the anterior cells have not been completely opened.

The fourth landmark is the natural orifice of the maxillary sinus. When the cells of the bulla and of the uncinate process have been opened, one at least of the natural openings of this sinus is easily accessible.

There is one part of the operation which requires particular care. It is the removal of the inner cell wall of the anterior ethmoid cells in the region of the cribriform plate. If the punch forceps be examined, it will be found that the female blade is always longer than the male blade, by about one millimeter. Now, the wall of the cells in this location is often quite thick. The roof of the anterior ethmoid cells is usually higher than the cribriform. If the female blade of the forceps is placed in the cell the end of the male blade can reach a point dangerously near to the cribriform. I therefore make it a rule to place the female blade in the nasal chamber and the male blade in the cell. In this

way the cut made must always be at least one millimeter from the cribriform. It is also particularly dangerous to use a blunt forceps in this region. I therefore reserve for this part of the operation a forceps which has not been previously used, and to open the blades after the cut has been taken and before the forceps is moved from its position.

The final step in the operation is the removal of the partitions between the various cells. In my earlier operations, I considered it necessary to remove these partitions until the lamina papyracea was as smooth as a board. I have found since then however, that this is not only a dangerous procedure, but that it actually prevents us from obtaining the best results from the operation. For, (1) the partitions become quite thick as they approach the lamina, and their removal requires considerable force. The lamina is no stronger than its thinnest parts and it can easily be fractured as a result of too much enthusiasm. If this mishap does occur it is advisable to insert a periosteal elevator into the fracture, to separate the orbital periosteum, and to remove a good sized piece of bone; for, a large opening is much less dangerous than a small puncture. (2) The thicker parts at the base of the partitions contain blood vessels, which enter the ethmoid region from the skull and from the orbit, especially the anterior ethmoid artery and vein and their branches. When the removal of the thicker parts of the partitions is attempted, these vessels are apt to be injured, with very profuse bleeding. (3) The thinner part of the partitions contains hard bone only, but the base of the partitions contains cancellous tissue, which is more easily infected, resulting in necrosis which delays or prevents the healing of the wound. (4) The scars which result when the base of the partitions is removed, are broad and form a network of broad bands covered with squamous epithelium, diminishing considerably the area of ciliated epithelium which alone can satisfy the requirements of perfect function. (5) These scars surround the remnant of each cell like a purse string, and when they contract, they reproduce the cell cavity with only a minute opening. On the other hand when the removal of the partitions is stopped just short of the thicker portions at the base, the danger of fracture of the lamina is avoided, severe hemorrhages are not so likely to occur, the cancellous tissue is not exposed and so the danger of bone necrosis and more serious complications is prevented and finally the area of bare bone is much smaller, the edges of the mucous membrane are much closer

together, healing takes place in a shorter time and the scars which form are thinner and their contraction is less powerful, so that the cells remain wide open. This applies to the sphenoid sinus as well as to the ethmoid cells.

In removing the partitions it is essential that the forceps be placed squarely on the bone, so as to cut true on all sides at once. If the forceps are applied obliquely to the bone, the bone will be fractured before it is cut, and small fragments will be left behind, hanging to the mucous membrane. In addition when the blades of the forceps, are not applied true to the bone, the mucous membrane will be sheared off, so that the edge of the remaining bone will be bared of its periosteum.

It is advantageous to have at hand a variety of forceps in which the heads are placed at different angles with the shank. In addition to the straight forceps, used for the greater part of the operation, it is necessary to have at least two others; one with the head at an angle of 45°, the other at right angles with the shank. In general, these forceps are most easily handled in which the male blade is above and opens in the direction of the handle, the female blade being below and being the stationary one.

The consummation of the technic as above described naturally implies the greatest accuracy and precision in all the manipulations. Such precision can not be attained unless the operation is nearly if not quite bloodless. Bleeding during the operation comes chiefly from three sources. The first, which is the most frequent, is the oozing from the cut edges of the mucous membrane. Adrenalin controls the bleeding from this source at the beginning of the operation: but as the operation proceeds, the irritation of the mucous membrane from the traumatism of the manipulations paralyzes the constrictors of the blood vessels, and so counteracts the effect of the adrenalin. The mucous membrane, which at the beginning of the operation was blanched and white, has become red and congested. The application of more adrenalin does not restore the blanched condition of the mucous membrane, for the constrictors of the vessels have lost the power to respond to its action. To the exuded blood there is also added a quantity of mucous which is secreted in increased amount. The mucus and serum, discolored by the blood, form a thick viscid wound secretion, which covers the field of operation and obscures and blurs the picture. In fact, under these circumstances, the operator sees, not the wound surface, but only the surface of the secretions. For the line of vision along which the operator must

look when operating intranasally is nearly parallel to the surface of the field of operation; so much so that the angle which the line of vision makes with the wound surface is greater than the angle of total reflection of the wound secretions, and it is just as difficult to place the instruments accurately upon the parts desired as it is to touch a stone on the bottom of a pool of water with a stick when looking sideways at the pool of water. The wound secretions cannot be removed by means of swabs, for wiping the mucous membrane is merely another form of traumatism which increases the difficulty. The trouble however can be overcome. The secretions can be removed, the bleeding stopped, the vasoconstrictors stimulated and the mucous membrane again blanched by a very effectual even if simple and obvious procedure, which, if it has been used by other operators is not recorded in their writings. It consists of irrigating the field of operation as often as may be necessary with ice-cold water. For this purpose, normal saline solution contained in an irrigating can is kept in a bowl of ice until needed. A canula, having the shape and size of a Eustachian catheter is introduced far back in the nose, and the operated region irrigated until the bleeding stops. Then the inferior meatus is also irrigated to free it from bloodclots and debris. After such an irrigation, the entire field of operation appears dry and clean. To those who have never used such irrigations during an intranasal operation, the distinctness with which all the details of the field of operation are made to stand out will be an agreeable revelation. The patients do not object to these irrigations.

The second source of annoying hemorrhage results from injuring the nasopalatine artery during the removal of the anterior wall of the sphenoid sinus. This vessel leaves the sphenopalatine foramen and crosses the anterior wall of the sphenoid sinus a little distance below the natural orifice. When it is injured, the bleeding is very profuse, filling the nose with such rapidity that on more than one occasion I found it necessary to pack the nose both from the back and from the front, and to discontinue the operation for the time being. Since I have learned however to prevent this hemorrhage, the opening of the sphenoid sinus has lost its terrors. The procedure is as follows: The natural orifice of the sinus is first enlarged just enough to remove the margin of the bony opening. This can always be done without injuring these vessels. A slender periosteal elevator, such as is found among the Freer submucous resection instruments, is introduced

between the bone and the proximal muco-periosteum and a pocket is made at least one half inch deep in a downward and backward direction and extending laterally to the septum and to the outer nasal wall. The upper blade of a powerful dressing forceps is inserted into this pocket, and the mucous membrane and periosteum crushed. The forceps is held in place long enough for the vessels to clot. The crushed mucous membrane is then severed in a vertical direction with scissors or a narrow bladed forceps, and turned back out of the way. The opening of the sphenoid sinus may then be continued without any further thought of these vessels. I have employed this proeedure many times, and it has never failed to prevent the bleeding. It is not nearly as diffieult to carry out as it might seem to be from the description.

The third source of severe hemorrhage is the anterior ethmoid artery. This vessel enters the anterior ethmoid region from the orbit, passing between the ethmoid eells within the bony partitions. The bleeding from this vessel is not usually as profuse as that from the nasopalatine, but the operation can not continue while it lasts. The vessel can not be crushed, beeause it is usually eontained entirely within the bone. The only way in which I have succeeded in stopping this hemorrhage is by plugging the opening in the bone with bone-wax. The bleeding is stopped temporarily by holding an applicator over the vessel with one hand and applying the bone-wax on the end of a spatula with the other. It requires dexterity to accomplish this manouver, and it may not succeed at the first attempt; but I have stopped severe hemorrhages from this vessel by this means on several occasions. Fortunately it does not happen often.

After the operation the patient is put to bed, but the nose is never paeked. If the post-operative oozing is pronounced it is easily controlled by spraying with adrenalin, coagulen solution or peroxide. After 48 hours the following routine treatment is employed. The nose is douched twice daily with normal saline solution, followed by a spray of 4% solution of antipyrine. The antipyrine acts as an astringent and antiseptic and tends to prevent the granulations from becoming exuberent. In the winter time this is followed by a spray of albolene. In young and healthy individuals, when the operation proceeded without unusual occurances, this is all that is necessary, and healing of the wounds is completed in about two weeks. If, however, the mucous membrane has been torn loose from the edges of the bone, if the

edges of the bone have not been cut off clean but if minute fractures have taken place, the healing is prolonged; for the bare bone which is stripped of its periosteum becomes necrotic and before healing can begin the dead bone must separate. Under these conditions granulation is delayed, the granulations tend to become exuberant. When the nose is examined during the convalescence, the parts are covered with a layer of mucus, through which it is impossible to see, so that the presence of granulation tissue is often overlooked. It is only when the nostril has been freed from mucus by douching, and after cocaine and adrenalin solutions have been applied, that the granulation tissue can be identified. For the cocaine-adrenalin solution shrinks and blanches the mucous membrane, but does not affect the granulation tissue. When the latter is present, it is dried with absorbent cotton and nitrate of silver applied. After drying off any excess of solution, the parts are sprayed with an oily medium. The strength of the silver solution depends on the condition of the granulations. When these are large and flabby, solutions as strong as 20% are used. When they are small and firm weaker solutions are used, and when epithialization begins, solutions stronger than 1% delay the process while very weak solutions favor the growth of the epithelium.

In the large majority of the cases the healing of the wound is completed in 6 to 8 weeks, and further treatment is unnecessary. But the function of the parts has not yet been completely restored. For the mucous membrane of the cell interiors is infantile in character, and it takes some time before it assumes the thickness and consistency of adult mucous membrane. During this time the nose is sensitive to sudden changes in atmospheric conditions so that attacks of acute inflammation of this delicate mucous membrane are apt to occur. These attacks continue until the nose has experienced at least one complete cycle of such changes i. e. until one year has passed. During these attacks the mucous membrane becomes swollen, edematous and greyish in appearance, sometimes distinctly polypoid. The surgeon who upon seeing this changed mucosa immediately seizes his curette, makes a grave mistake; for if the inflamed mucous membrane is treated in the same way as the exuberant granulations are treated, but with milder solutions, the inflammatory changes will disappear in a few days, and the mucous membrane will return to a normal condition. Occasionally during the course of the convalescence, the mucous membrane, otherwise

healthy in appearance, will be found dry and covered with crusts and flakes of dried mucus. This is due to the fact that the cilia on the surface of the mucous membrane fail to functionate. To restore the motility of the cilia, I know of no more efficient procedure than to douche the nose two or three times a week with a watery solution of menthol. This solution is prepared by floating menthol crystals on the surface of distilled water contained in a separating funnel or in a bottle with a stop-cock near the bottom. After 24 hours the solution can be drawn off at the bottom. This solution is much too strong to be used pure. It is usually diluted ten times, and in this strength it leaves a feeling of warmth in the nose for one or two hours. I have found but few individuals who could tolerate it stronger than one to four. The efficacy of this solution is due to the fact that it is a colloid solution, which mixes and dissolves readily with the mucus in which the cilia are imbedded, and so reaches the substance on the epithelial cells in a very efficient manner.

It is advisable to instruct the patient to lengthen the intervals of home treatment and to discontinue it altogether as soon as conditions will permit, for patients are very prone to contract the habit of nose-douching, and to keep it up long after the need therefor has ceased.

DISCUSSION.

Dr. Harris P. Mosher, Boston, said that Dr. Yankauer's paper was full of meat. Dr. Yankauer said he had 80 per cent. cures, but one man said "once a sinus patient, always a sinus patient." Usually the results were disappointing. The danger of infecting the dura by energetic methods in the ethmoid was purely theoretical. Dr. Mosher said he had reduced his instruments for ethmoid work to a ring punch and a curette. The very small instrument was dangerous. The superior maxilla was taken as a guide to the ethmoid labyrinth and naso-pharyngeal locality. There were many perplexing lines, suggesting a very full telegraph pole, but one must know one's anatomy as thoroughly as possible. Dr. Yankauer was to be congratulated on his method of going right to the artery which crossed the front of the sphenoid. If one could preserve mucous membrane one could get early healing, but quite a large portion of the paper was given up to the subject of combatting granulations, which made one wonder if the speaker had ever happened to injure the mucous membrane.

Dr. Greenfield Sluder, St. Louis, said that Dr. Yankauer's procedure differed radically from his own, but he agreed in his effort to open all the cells. Did he remove his middle turbinate? Dr. Sluder said he had never felt the necessity of opening the sphenoid for the ethmoid operation, unless it were involved. The middle turbinate, if not removed, later would become hypertrophic. The ethmoid was operated by the speaker, beginning at the top and going downward and forward, contrary to the usual technique. Dr. Cushing had made a black charge against rhinologists attributing many cases of menin-

gitis to nasal interference. Dr. Sluder said he had never had a case of meningitis in his clinic.

Dr. B. R. Shurley, Detroit, said that the specialist had trouble in choosing between the different methods and instruments which are put on the market from year to year. There were three classes of operative procedures: (1) clinical; (2) for private patients; (3) for one's own family. There was always a personal equation. Some operators were extremely skillful and competent to perform complete exenteration of the sphenoid and ethmoid. There were others who were not so qualified. There were three classes of cases which required careful study and selection: (1) obstructive; (2) without symptoms; (3), infection of various degrees, up to endangering life. There was a choice of judgment to be rendered to each individual patient as to procedures. Fads and fancies of med cine must be disregarded, and a careful study and analysis of anatomic specimens and of operations was the way to familiarize oneself with the anomalies that were present. Study of Dr. Haskin's specimens would show the impossibility of exenterat'on of the ethmoid cells in every case. Cases might still have suppuration after the most complete operation. The local infection, and the resistance of the patient should be studied, as well as complicating conditions, before deciding on the form of procedure. In some cases this would be exenteration of the sphenoid, in some the ethmoid as well as much of the middle turbinate was involved."

Dr. J. M. Ingersoll, Cleveland, Ohio, spoke on Dr. White's paper and said that the optic nerve might be involved by extension or by secondary effect, the former being due to inflammatory condition in the cells. Operative procedures and instruments were a matter of personal choice. Larger instruments were less dangerous, but the operator should choose what he worked best with. The nose must have a certain amount of immunity, otherwise there would be more infections. It was best to leave the nose alone after operation, it did better if not meddled with. Spraying interfered with healing. Stereoscopic X-ray work helped greatly in outlining the sinus and the operative field. After careful study one should decide on the procedure of choice, whether ethmoid, or ethmo-sphenoid operation. If the sphenoid were not involved, it was better let alone.

Dr. Ross Skillern, Philadelphia, said that he was glad to hear about Dr. Colver's operation on the turbinate and he would try it. He did not pack the sinus any more. He had seen meningeal symptoms develop. He was sorry to be obliged to state that his experience had not been the same as Dr. Yankauer's, with the ethmoid. He had not been able to reach the 80 per cent degree of perfection. Dr. Yankauer spoke of opening all the cells. He had seen such cases where opening the bulla, with drainage, effected a cure. Why open all the cells? As to leaving the mucosa, there would probably be a mass of shreds and patches left. What would become of them? Any collection of pus must be cleaned out. In one case seen there was a large opening in the anterior wall which was fistulous for a long time, though the cavity shrank. Behind the cavity there was a mass of granulation and pus. This was cleaned out with a curet, and the patient recovered with no recurrence.

Dr. Hanau Loeb, St. Louis, said that he was amazed at Dr. Yankauer's wonderful technic, in being able to bite away cell after cell as he pleased; others could not do that. Dr. Sluder's method was effective and simple. It was impossible to do a complete operation where the cells were anomalous. Some cells followed the anterior cells of the orbit until they completely covered it. Dr. Haskin had shown specimens of these anomalous cells which illustrated the difficulty excluding simple cases, which were always cured. 80 per cent result was high.

The technic would be worth learning, but there was little justification for removing cells which showed no abnormality and no grounds for doing so were proven by this paper.

Dr. Jos. H. Abraham, New York, in speaking of the development of surgery of the sphenoid sinus, spoke of primary sphenoiditis. This was the diagnosis in three cases. The patients complained of severe pain over the occiput. In regard to loss of vision, one striking case was seen in which the nasal cavity was filled with polypi and there was pus in the post nasal space. The left eye was completely blind and right vision hazy. After operation and cleaning of pus from the ethmoid cells there was complete restoration of sight with good recovery. After several trials with curet, the speaker said he had discarded them as he had better results with forceps. As to 80 per cent cures, that was a low figure for typical ethmoiditis cases.

Dr. Lewis A. Coffin, New York, said that these papers touched upon two or three of his own hobbies. His operative technic was to go into the ethmoid with the chisel, and if it was found diseased he made a long incision downward until he could get Luc's forceps into the nose. He included the middle turbinate. That operation was thorough and there was little hemorrhage. Ethmoids over the orbit might not be touched. In regard to mucous membrane, one frequently took it out, but it was probably diseased. In regard to pathology and etiology, the optic nerve was in a diseased and edematous zone, which might explain that non-hysterical case that Dr. Sluder mentioned. He had seen two such cases in two young ladies, both artists, both had been considerably improved in vision since operation, and although such cases might be hysterical in origin the results were good. They were able to continue art work and were practically well.

Dr. Harold Hays, New York, said that it did not matter what instrument was used provided you could keep the field ischemic and anesthetic and get a good view of the inside of the sinus. He had published the details of a bloodless ethmoid and sphenoid operation. The turbinate covered with cocain mud and then injected with cocain and adrenalin by a syringe with 60 minims of solution which was allowed to penetrate half an inch, then the other points were injected. There was practically no hemorrhage. The speaker said he made a nick with the scissors then pushed a small chisel through the ethmoid cells, and on reaching the anterior wall of the sphenoid a fragment was depressed on the interior meatus, after which a probe was passed into the opening of the sphenoid and the anterior wall chiselled off. This operation was not at all dangerous.

Dr. George L. Richards, Fall River, said that this treatment was entirely surgical. Every man could take the ethmoid cells out but would it benefit the patient? He had met one gentleman who had had a thorough ethmoid operation, and who said he felt worse and wished he had been let alone. Cushing had said that the nose and throat men were often respons ble for meningitis. He believed conservative treatment with irrigation of the sinus would in many cases do more than forceps, punches and curets.

Dr. Jos. C. Beck, Chicago, said that Dr. Yankauer had read his paper to provoke discussion and to see how many would take a fling at him. There were excellent points in the paper, but his percentages must refer to patients on whom he did the first operation, because many of these patients had had two or three operations. Simple sphenoid operations should give higher percentages. Dr. Beck said he wondered how Dr. Yankauer could possibly tell what degree of necrosis or sequestration existed in the posterior wall of the sphenoid, and the same thing was true of the lateral wall.

Dr. Wm. H. Haskin, New York, said that he would like to say a word of warning to some of the men who had not had much experience in studying the bones. He had some specimens to present, and if the men would study them carefully they would perhaps be a little more cautious in their operative procedures on the ethmoids and sphenoids.

Dr. B. N. Colver, Battle Creek, said that the veins of the mucous membrane of the sphenoid and posterior ethmoid were related to those of the periosteum of the orbit and the connective tissue with the optic nerve. The internal vein of the osseum was related to the optic nerve, also so that in case of venous toxemia the macular bundle might be affected, causing scotoma. A pus pocket could cause toxic absorption in the canalicular portion of the tissue with effect on the periphery of the nerve and enlargement of the blind spot. In regard to the turbinate, in one case of a woman who complained of asthma, there was marked polyp formation of the middle turbinate with thickening and edema. The lateral half of the middle turbinate was removed, and nothing else was done. The case was cured of asthma.

Dr. L. E. White, Boston, said that it was a question of clean surgery without traumatizing the tissue. Dr. Sluder's method was easy and quick. In regard to optic cases there were many of retrobulbar neuritis which would recover. In regard to the middle turbinate, if it would contract by suction the case was favorable for treatment. If there was blocking it was not possible to reach it. It was important to relieve the edema by reaching the root of the middle turbinate. This was not possible by conservative treatment.

Dr. S. Yankauer, closing, said that this was a very vigorous discussion. He was limited to twenty minutes and had necessarily left many things unsaid. A very important point had been made by Dr. Richards —one should not operate on every case that presented itself; all should be conservatively treated first. A number of cases of ethmoiditis of long standing got well under conservative treatment. Whether one operated with this instrument or that, was of less consequence than the operative result. It was essential, in his opinion, that the mucous membrane should be left against the laminae papyracea and floor of the bone. The instruments most successful in his hands were the sharp punch and the forceps. Drs. Coffin and Hays entered with the chisel and got in deep and used the hammer,—that was operating in the dark. If Dr. Beck saw cases that had been previously operated on, it was not surprising that there was bone necrosis. Dr. Yankauer said that in his cases he did the primary operation. Under other conditions he threw up his hands and did not expect to cure the patient.

DEMONSTRATION OF THE IMPROVED METHODS OF MEASURING THE TONAL RANGE, SHOWING PROGRESSIVE DEVELOPMENT OF THE APPARATUS.

By C. C. BUNCH, University of Iowa.

The work which I have been called upon to report to you has been carried on more or less intensively for the past four years at the State University of Iowa. During this time the limits and possibilities of part of our apparatus have been fairly well defined and the significance of the application to clinical diagnosis has been shown by your president, Dr. Dean, in his address. The immense amount of work remaining to be completed from the clinical viewpoint, as well as mechanical construction, leads us to feel that the problems are little more than touched.

The writer wishes in advance to state that he is very greatly indebted to several departments in the state University for their hearty co-operation and assistance. Prof. A. H. Ford, of the Department of Electrical Engineering, and Prof. C. W. Hewlett, of the Department of Physics, have generously assisted in the design and the construction of the apparatus. Prof. C. E. Seashore, of the Department of Psychology, has given the full facilities of his laboratory and as Dean of the Graduate College has been instrumental in securing financial aid. Last, but by no means least, Dr. L. W. Dean has spent much time in the analysis of results from a diagnostic viewpoint and has been a source of constant encouragement.

A brief survey of the problem and the principles involved may perhaps be significant at this point. It appears from the otological literature that since Bezold presented his continuous tone series of forks and whistles to the medical world that there has been little advance in qualitative and quantitative measurements of the acuity of hearing. Regardless of the fact that today many clinical examiners possess the continuous tone series, or some similar set of tuning forks, we find that functional examinations are, as a rule, limited only to measurements of the octaves, usually five, and the determination of upper limit with the Galton whistle. If the examiner uses the method described by Bezold, the forks are struck with the "hardest blow" and the acuity of hearing of the patient is recorded as a fraction, the numerator being the perception time of the patient and the denominator that for the normal ear.

Others more pressed for time record these measures in terms of distances. The chief objection of the otologist to either of these methods lies in the fact that they require too much time and even when most carefully given are only approximations. The greatest error in these examinations, from a scientific standpoint, lies in the fact that they include only a limited portion of the hearing range. Tests of acuity for five or seven forks, for tones between 16 v.d. and 4096 v.d., reveal the sensitivity for only these five or seven widely spaced portions of the organ of hearing. Such examinations reveal nothing as to the sensitivity of the 4000 odd intermediate tones.

If I may quote Bezold again, "We have completely examined the hearing as soon as we know quantitatively the hearing for all tones," but a few sentences later he says: "There are, therefore, only patients with the highest degree of deafness which require an examination with the whole sound scale". During the past year, records of our clinical examinations show that 43% of the cases tested show the presence of tone gaps in some portion of the range of hearing, i. e. these patients are unable to hear certain of the loudest tones which we have been able to produce. This, to us at least, indicates that a more complete examination than is possible with the continuous tone series is necessary for differential diagnosis. In addition, the "hardest blow", which Bezold uses, is a widely varying factor. It has recently been shown in the University of Michigan that the energy of freely falling hammers may vary as much as 20%. When the human factor enters these computations the error must be much greater.

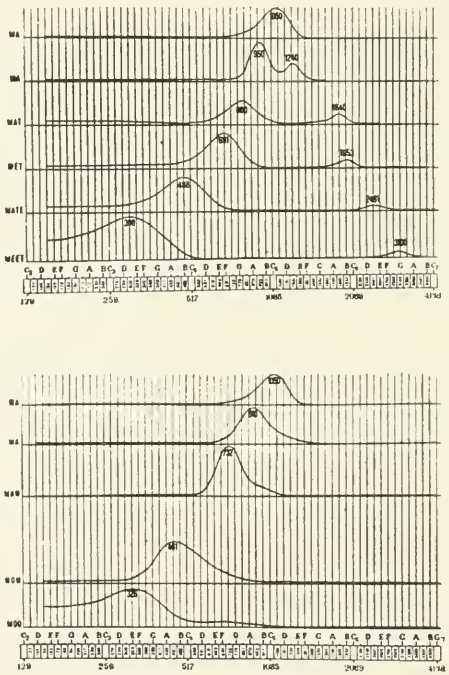
Tests of acuity for sounds of the voice while of great significance to the patient seem to add very little assistance in clinical diagnosis. In addition to the great variation in the intensity of the voice, it has been shown by Prof. Dayton C. Miller that the voice stimulates but a limited portion of the tonal range. Plates I and II, which are from his book "The Science of Musical Sounds", show that this region is approximately from 300 v.d. to 3000 v.d. and varies with different words.

To summarize, then, the ideal hearing test should afford an accurate quantitative measurement of acuity for *all* tones: should consume a minimum of time, and require only such skill in manipulation as may easily be acquired by the practical otologist, or his assistant. This is our ultimate goal. As will be shown, we have not reached this ideal.

The Pitch Range Audiometer.

With the view of solving some of the problems, we have constructed an instrument called the Pitch Range Audiometer. It is an audiometer in that it furnished a means of measuring hearing ability and since these measurements are possible through a wide portion of the range of audible tones it is called the Pitch Range Audiometer.

This instrument consists essentially of two alternating current generators (A and B, Plate III) driven by a variable speed D. C.



motor (C, Plate III) and a telephone receiver for transforming the electric oscillations which are generated into sound waves. Accessory parts of the instrument are a rheostat (A, Plate IV) for varying the speed of the motor, a frequency meter (D, Plate III; attached to the dial, B, Plate IV), a standardizing battery (6 volts, 4 dry cells, switches at D, Plate IV), and a series of resistances (C, Plate IV) for varying the current in the telephone.

The range of tones covered is limited largely by the mechanical construction of the driving motor; in this case, the slowest speed available being two rotations per second, and the highest one hun-

dred. The two electric generators (A and B, Plate III) consist each of two parallel plates, one fixed and the other attached to the shaft of the motor rotator. On the adjacent surfaces, at the circumference of these plates are matched teeth. On the larger pair are 150 teeth and on the smaller, fifteen. Between the pairs of parallel plates lie two coils (Not shown in diagram.), one of which carries the current from the standardizing battery and is for the

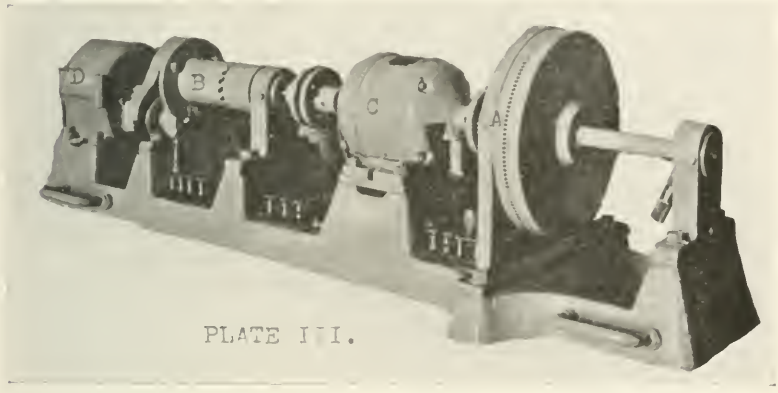


PLATE III.

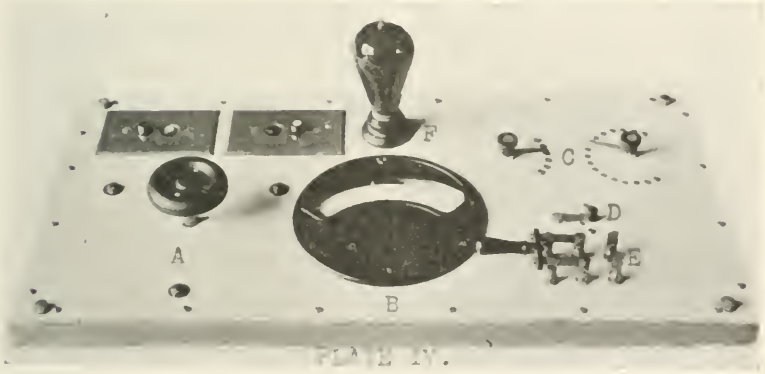


PLATE IV.

purpose of producing a constant magnetization of the two plates. When the teeth of the similar plates are opposite each other, because of the small air space in the field (.008 in.) the magnetic flux through the plates is at a maximum. When the wheel turns so that the teeth of the movable plate are opposite the spaces in the one which is stationary, this distance is increased to its maximum. Consequently the magnetic flux through the plates varies from a maximum to a minimum as rapidly as the teeth approach and

recede from each other. This variation in magnetism induces an oscillating current in the other coil located between the plates This one is in series with the telephone receiver. Since there are 150 teeth on the larger wheels, two rotations per second, the minimum speed of the motor, will produce 300 oscillations per second. The fifteen teeth on the smaller wheels will give tones as low as 30 v. d. per second. With the two generators a range of tones from 30 v. d. to 15000 v. d. is therefore available. A switch, (E, Plate IV) is so arranged that the current from either generator may be led to the receiver as desired.

The intensity of the sound in the receiver is regulated by a series of resistances, or more technically, by a potentiometer which varies the potential difference between the terminals of the telephone. These resistances are constructed on a purely arbitrary scale, the successive steps increasing 200%. (The terminals of the resistances are shown in Plate IV, C.) These steps were found to be smaller than was necessary in actual practice so only alternate steps have been used, giving successive increases of 400% in the resistance of the circuit. It is not to be understood that these steps for any definite pitch give actual changes in the intensity of the sound of 400%. While it has been shown by many experimenters that the sound energy in a telephone is a linear function of the current passing through it, these steps are only relative and when we speak of intensity steps the expression only indicates the resistances which regulate the current passing through the receiver. Actual determinations of intensity are scarcely necessary for such work, nor are they made in practice where values are indicated in the form of ratios.

The pitch of the tone is indicated by means of a frequency meter, or more accurately, by an electric tachometer, the dial of which is calibrated in terms of vibrations per second and attached to the control board (Plate IV). This tachometer is simply an electric speedometer similar to certain types used on automobiles or aeroplanes. The instrument is of standard design.

Procedure.

The technique of testing is simple. The control board (Plate IV) is placed in a quiet room so that outside noises will not distract the attention of the patient. The telephone receiver is held at the ear of the patient and he is instructed to indicate by some noiseless method that he hears the sound. For convenience we use an electric key and lamp (F, Plate IV) and the patient is instructed to press the key as long as he hears any sound. If a check on the

results is desired, a switch leading to the telephone (E, Plate IV) is opened. If the patient still presses the key it is obvious that he is inattentive to instructions.

Two methods of making determinations are possible. One, which is very similar to that with the tuning forks, consists in adjusting the speed of the driving motor so that a certain fixed tone is produced. The intensity is then diminished until the sound becomes inaudible. This offers several advantages over the tuning forks. It may be repeated for as many tones as the examiner desires. It gives accuracy and consistency impossible with the tuning forks. The results may be checked without loss of time. There is no long wait with a stop-watch to determine the time of dying out.

A new and more comprehensive method has been developed, one which is limited to instruments in which a tone of continuously changing pitch is available. By this method, the intensity is fixed and the pitch varied. When all the audible tones at a certain intensity step have been determined, the process is repeated for either louder or fainter steps in the same manner. As the tone gradually changes in pitch with the increasing or decreasing speed of the motor, should there be a loss in sensitivity for any of the tones produced, the patient will indicate this by raising the key. This may be varied by testing with either louder or fainter sounds as desired. The records by this procedure are conveniently shown on a graph with the pitch of the tones as the ordinates and the intensity steps as the abscissas. The points at which the observer begins or ceases to hear are indicated on this graph by dots. The process is repeated for each intensity step. At the close of the examination these dots are joined to show a curve which indicates the field of hearing. Comparison with that for normal hearing will show the exact location and extent of any loss or increase in sensitivity.

This method of testing offers many advantages over the fork test. First and most important, no tones are missed. Second, the results may be checked without loss of time and each trial at decreasing intensities is an additional check on the louder ones. Third, a sound of continually changing pitch is attended to with a minimum of energy and fatigue to the organ. Fourth, the time consumed is much less than the old method. Concerning this point, the average time for a clinical test with the audiometer used during the past year has been fifteen minutes. If the mentality of the patient is below normal, or if the examination shows the presence of defects which need constant verification, the time mentioned is insufficient. The reliability of the test from the consideration of the response

of the patient is certainly on a par with other functional tests of a similar nature.

The use of the telephone in tests of hearing is subject to criticism because of the variation in types of telephones. It is probable that no two receivers are identical. Our records with six receivers on a trained observer show variations indicated by at least one step in intensity at certain points in the scale. We found also that the same trained observer would give us variations as great as this with the same receiver due to fluctuations in attention and to physical condition. It seems desirable that for intensive work a normal curve for each receiver should be established and if practical to use the hand type of receiver rather than the watch-case type, because of its more substantial construction.

Another criticism of the telephone is due to the fact that it comes in contact with the head and the results must necessarily indicate to a certain extent a measure of hearing by bone conduction. According to physical laws it is probable that a portion of the energy may be transmitted in this manner. We find, however, that patients who have increased bone conduction and decreased air conduction for the tuning forks do not show a greater sensitivity when the telephone is used because of this actual contact. It is probable that the conduction by contact is small, especially since the amplitude of the vibration of the diaphragm for a faint tone is of the order of the distance between the molecures of the iron of which the diaphragm is constructed. To eliminate this possible source of error we have attached a soft rubber cushion to the receiver so that there is no direct contact between the telephone and the head.

Our observations, because of the speed of the motor first available, have been limited to the range between 30 v.d. and 7070 v.d. In the Psychological Laboratory of the State University of Iowa, Mr. B. F. Zuehl, with an instrument somewhat different in construction has conducted a series of examinations with two hundred observers over the range between 30 v.d. and 14500 v.d. As shown in Plate V, he finds that the observers lie readily in several groups. These are indicated in the chart in groups of 10, 20 and 40%. Twenty-two intensity steps were used to get small differences and the individual tests lasted thirty minutes.

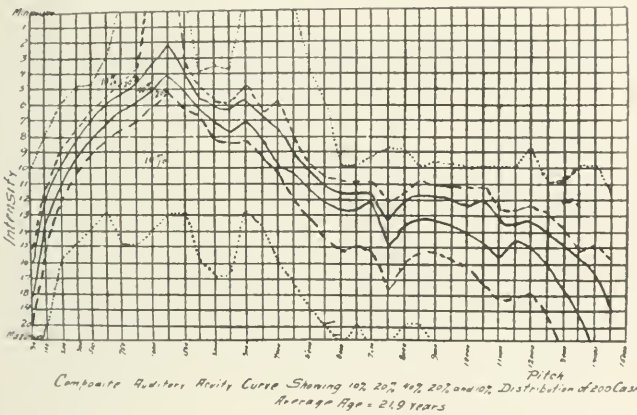
A brief examination of the curve shows that the most significant part of the range is below 9000 v.d.

An interesting feature of the work has been with malingerers. Records show that patients who are entirely deaf in one ear will give what we have termed a "shadow curve" when the telephone is

at the deaf ear. This indicates that the sound when sufficiently loud will be conducted to the good ear. This is impossible when the noise apparatus is used in the good ear. Malingerers have shown that they will give no shadow curve, no matter if the stimulating sound at the supposedly deaf ear be intense enough to be heard at a distance of several feet.

The Highest Audible Tone.

The upper limit of acuity is an unsolved problem. Regardless of the fact that practically all text books in otology, physiology, psychology and physics set rather definite limits, the wide variation in their statements leads us to feel that certain vital factors in making such determinations have been overlooked. For ex-


Intensity
Pitch
Composite Auditory Acuity Curve Showing 10%, 20%, 40%, 20%, and 10% Distribution of 200 Cases
Average Age = 21.9 Years

ample, Bezold's Text Book in Otology and Howell's Physiology place the upper limit at 41,000 vibrations. Seashore's Psychology of Musical Talent says that a youth may hear thirty or forty thousand vibrations or perhaps even higher tones. Duff's Text Book in Physics gives the frequency of the highest audible tone as 20,000.

While otological practice may not necessarily demand the actual determination of the highest audible tone any more than it demands the lowest, differential diagnosis certainly makes it necessary to ascertain the relative acuity for tones in the upper portion of the tonal range.

Instruments available for such measurements are of four types: The Galton whistle, Koenig cylinders, the monochord and the telephone with some form of high frequency oscillator. The Galton whistle as modified by Edelmann is in such common use

that no description here is necessary. It should, however, be remarked that the records with the whistles, to avoid error, should be in terms of vibrations. These are secured from the charts which accompany the whistles from the factory and which are calibrated for each whistle. It is insufficient to record the length of the pipe alone. The width of the mouth is also a detriment. Both vary in different instruments. Three whistles have been available for this study. Comparative results are shown below.

The Koenig cylinders are less widely known and a short description may be necessary. The cylinders, or bars as they are often called, come in sets of 22 and are calibrated in the musical scale according to French notation from 8192 v.s. to 65536 v.s. The tones arise from the longitudinal vibrations set up as they are struck with a metal hammer. Two sets have been available for this study.

Schultze's monochord, as modified by Struycken, consists of a steel wire maintained at constant tension between two uprights fixed on a rigid bar. Between these uprights a movable bridge passes over a fixed scale indicating the frequency. The tones may be excited by bowing. High ones are secured from the longitudinal vibrations set up by rubbing the wire with a friction sponge.

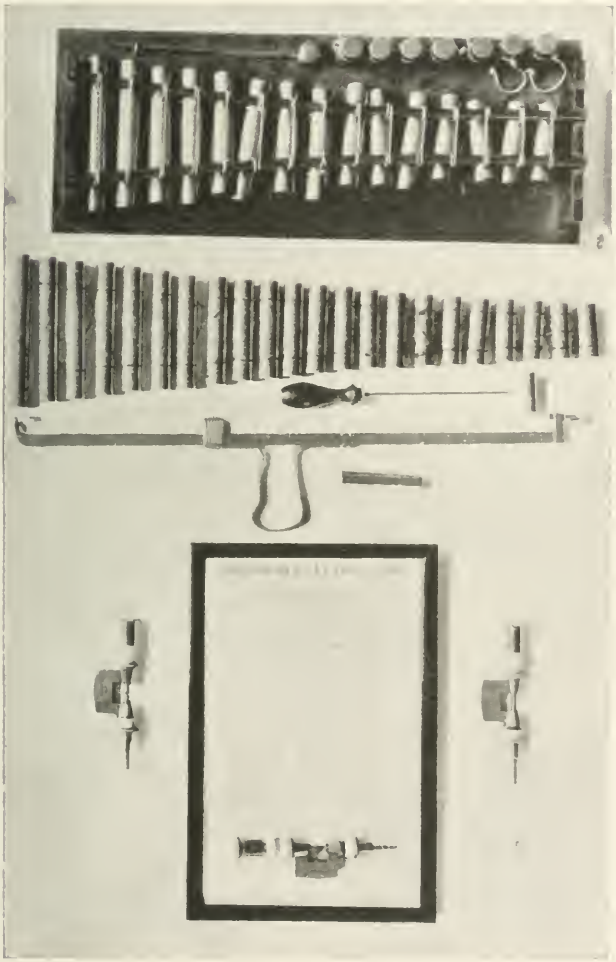
These are illustrated in Plate VI.

As a basis for comparison, determinations of the upper limit of acuity for a clinically normal adult observer were made. These are shown below. It is sufficient to say that in no examination we have made have these results been exceeded by more than 2000 vibrations.

	Upper Limit.	
Whistle No.	Upper Limit	Calibrated to
378	49,000	50,000
1029	21,000	29,000
1813	23,000	25,000
Koenig Cylinders		
No. 1	49,152	65,536
No. 2	43,960	65,536
Monochord	A. C. 19,000	25,000
	B. C. 20,000	

The great variation apparent in these results may possibly have a very simple explanation. The Koenig cylinders are marked distinctly according to the French custom in terms of single vibrations. The whistles are simply in terms of vibrations which may

be either single or double vibrations. If the calibration for whistle No. 378 be in terms of single vibrations also, the range in these observations will then be from 19,000 to 24,500 double vibrations, a discrepancy which may easily be attributed to the differences in intensity of the tones emitted.



All the evidence obtainable from the audiometer tests seems to indicate that tone gaps may occur in any portion of the range. The prominence given in clinical examinations to the determination of the upper tone limit indicates that defects in this region are of important diagnostic value. With the instruments just described, it is not possible to produce tones of continually

changing pitch except with the Galton whistle, which would necessitate a source of continuous air pressure. The greatest difficulty, that of securing relative measures of intensity would still remain unsolved. Again we have turned to the field of electricity for the solution of our problem.

Vacuum Tube Audiometry.

It has been stated that the fourth method for securing tones of high pitch is by means of a telephone or some other form of tone generator in a circuit with an oscillating vacuum tube. Research in this field is of comparatively recent origin. Birnbaum in Germany, determined by this method the upper limit was 25,000 v. d. In America, the great impetus given to the study and perfection of wireless telephony during the war has made it possible to secure standardized vacuum tubes. I have personally been in touch with five experimenters in the laboratories of the middle west who are using vacuum tube oscillators in making determinations as to the energy necessary to produce a minimum audible tone. So far as I have been able to discover, only one, Mr. C. E. Lane of the University of Iowa, has made any attempt at a determination of the energy required to produce audible sounds in the region of the upper limit.

It is not my intention to enter into the theory of vacuum tubes and their operation, but rather to show how far we have progressed in the application of this method toward measurements in the tonal range.

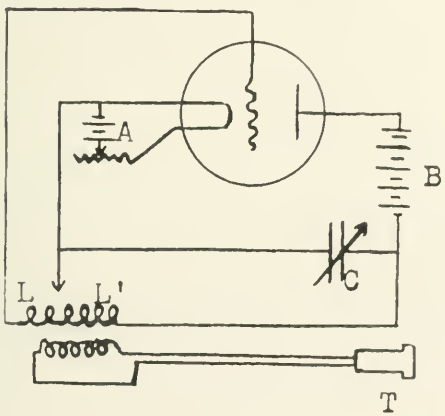
With the co-operation of the Department of Physics in the University of Iowa and under the immediate supervision of Dr. C. W. Hewlett, we have attempted to construct a workable vacuum tube audiometer. No attempt to get the apparatus in a practical form has so far been made. To accomplish our purpose two fundamental problems must be solved. First, a tone of continually changing pitch must be available. Second, accurate control of the relative values of intensity must be provided.

A diagram of the electrical connections is shown in Plate VII.

A brief study into the theory of vacuum tube oscillators shows that the frequency of the oscillations depends upon the inductance and capacity of the circuit. Variation in either of these factors will result in a corresponding change in frequency. In the system with which we worked, the inductance (L and L, Plate VII) formed a part of two circuits and since the capacity (C) was in but one it was decided that the latter should be our variable. A

capacity with 120 steps producing tones from 2,000 v. d. to the upper limit was constructed. Resistances for controlling the intensity similar to those used in the pitch range audiometer were provided. After trial, it was found that such an arrangement would answer very well except that any tone gap lying between these steps would be missed. Moreover, the change in capacities resulted in a disturbing noise in the telephone receiver. A variable condenser in which these errors were eliminated had to be secured. Since none could be purchased, a condenser meeting the requirements was constructed as follows:

Semi-circular plates of metal, hermetically sealed and insulated, were mounted on a rotating shaft. As the plates are turned on this shaft, they dip into a vessel filled with mercury, the capacity



being determined by the depth to which they enter the mercury. A pointer attached to the shaft passes over a scale to be calibrated in vibrations per second. This gives a continually changing capacity which results in a tone of continuously changing pitch in the telephone. We have at hand the necessary requirements for extending our research to the upper limit.

Our apparatus is not complete nor permanent. No measurements have been attempted. The practical benefit of such procedure is problematical. However, the procedure with the pitch range audiometer leads us to feel that many problems concerning the upper portion of the hearing range can be solved only by some such methods.

DISCUSSION.

Dr. Max A. Goldstein, St. Louis, said that the advantages of university team work were seen in these studies by Mr. Bunch and Dr. Dean. The cooperation of the physicist, the otologist, the teacher of the deaf, and the teacher of corrective speech, would help the work along. The question of functional tests had less attention than it deserved. The standardization of the tuning fork was an important step. This instrument did not supplant the fork, but it was necessary as well. In regard to the whistle, the Edelmann whistle was not the same as 20 years ago. There was no standard of intensity in the voice tests of the otologist. Low whisper, and loud whisper were not comparable terms. This resulted in inaccuracy. In regard to tone islands, these formed the basis of some of the pathological conditions encountered. Electricity was a definite factor in the matter of instruments and not subject to the variat ons of the human voice. If, however, this instrument was to be used for tests, the otologists would have to go to the university laboratories for their clinics. It was not likely that the instrument would be in use in many places. He agreed with Dr. Dench that the high pitch for over C 345 was not of much consequence in the tests. The higher the pitch the less the penetration from the bone conduction point of view. The audiometer had its limitations and when Mr. Bunch had combined it with the audio-amplifier it would be valuable on account of the uniformity of the electrical apparatus.

Dr. George F. Keiper, Lafayette, Ind., said that a simplified form of this instrument would stand in the relation to otology that the perimeter did to ophthalmology, the latter measured scotoma and the former mapped out the range of hearing.

Dr. E. B. Dench, New York, said that it was a great pleasure to look at any scientific work designed to perfect a special instrument. Mr. Bunch had had a difficult task and had succeeded admirably. Tuning forks had determined qualitative hearing rather than quantitative. There was a sharp distinction between how far a patient heard and what sort of sounds he heard. In the human voice there are words of different musical value, such as meet, mate, met, with d fferent pitch. Whispered speech or spoken voice gave an accurate quantitative test, varying from 300 to 3000, which gave fairly uniform results, with low whisper, moderately loud whisper, spoken voice, of varying degrees of intensity. Exam nations could be made in much less time than recording the patient's hearing of the 16, 32 or 64 fork. That was not accurate because the patient might have tone gaps. The tuning fork determined the low limits and the Galton whistle the high notes. The amplitude of vibrations made little difference, except that by striking the tuning fork as hard as one could one could reduce the low limit. With the 256 fork, with the clamps on, it registered 163 vibrations. One could practically disregard the force with which the fork was struck. This instrument of Mr. Bunch, would be more valuable when it was modified so that the record would not be one of the individual instrument. The charts made in New York and in Chicago should be the same.

Mr. Bunch said the difference lay in the telephone receiver.

Dr. Dench said that another point would have to be corrected. With the Bunch instrument he heard only 3,400 double vibrat ons. He did not think he was so deaf as that. He had a 19000 upper limit with the Galton. In regard to the closed organ pipe, the length of the pipe must not be less than four times its diameter. If one took the Koenig rods and sounded the Galton whistle at random, the rods would give a sympathetic vibration within 100, which was fairly accurate.

Professor Miller said that he considered it a privilege to speak to the meeting on this subject in which he was interested as a physicist. He did not know about its application to the measurements of the ear, but he was interested in the application of the apparatus. He thought that the instrument was going to form a standard for tuning forks, but that it was too crude in the sense of application for every day practice. The development of the electro-mechanical method would prove to have a useful working basis and be more satisfactory than anything that had yet been used. The manner of indicating the pitch that had been referred to had been changed in the last 25 years. Formerly one used single vibrations, but now double or complete vibrations. That was the practical explanation of discrepancy in the test forks. He was interested in the upper tone limit and he was sure that results at Iowa would show that the upper limit was not far from twenty thousand, probably above it. The difficulty had been that they had not used pure tones. Sound waves had been photographed and analyzed and the most important sounds had the clear enunciation of spoken words, from 250 to 3000 double vibrations. The telephone people were quite content to cut out vibrations above 3000. The frequency required was not much below 300. The speech of children from 6-8 years was rarely below 300, running up to 3000, and this was clear and incisive. Certain sounds did not help in enunciation, such as "S" sounds, or whispered or whistled sounds. These sounds were a nuisance. One did not know what the pitch was, perhaps about ten thousand per second when experimentally produced. The physicist should help prepare standards for the otologist; their combined work would be useful in every way.

Mr. C. C. Bunch, closing, said that he had stated particularly they had found no clinical significance in the voice tests. Dr. Dench mentioned using low whisper, loud whisper, etc. Why did he use four steps of intensity of the voice when he did not use intensity of the forks?

Dr. Dench said that he was pressed for time, and he could judge if a man could hear a moderately loud voice.

Mr. Bunch asked why, if there was no use in measuring intensity in anything, did Dr. Dench measure intensity with the voice? He could not tell the pitch he was using.

Dr. Dench said he did not test for particular words. That did not tell him anything about defects of hearing.

Mr. Bunch said that a man might be deaf for certain words, and not for the tones above and below. He might be able to hear 00 when he could not hear the short 0.

THE TONSIL QUESTION — RELATION TO DUCTLESS GLANDS. FUTILITY OF OPERATIVE INTERFERENCE IN THE "EXUDATIVE DIATHESIS TYPE OF CHILDREN."*

By GRANT SELFRIDGE, M. D., San Francisco, Cal.

The modern tonsil operation had its birth twenty centuries ago, and to Celsus one must give the credit of performing the enucleation with his finger.

History does not tell us why the complete enucleation operation went into the discard, but it lay there in a state of "innocuous desuetude" until it was resurrected by the late Dr. John Farlow of Boston, thirty odd years ago. Apparently progressive Boston did not follow in Farlow's footsteps, and it remained for Chicago to re-locate the operation, and it fell to Dr. Charles M. Robertson to describe a new method of removing tonsils at the New Orleans meeting of the American Medical Association in 1903.

It was my happy privilege to meet Dr. Robertson and see his method of procedure, prior to the New Orleans meeting. On my return home I undertook to work out an operative technique, and to start a propaganda, based on observations made in the Eastern states, that no tonsil was a good tonsil, and therefore should be removed forthwith.

Since that time we have watched the game progress, participating in it, to be sure, and have seen it claimed in many articles on "Tonsils," that all diseases between "fallen arches" and alopecia areata, including deformities of the nasal septum, high arched palates, as well as deformities of the teeth and jaws, are attributed to the tonsils, whether diseased or not.

Even the laity, the all wise, with and without medical advice, frequently have insisted on the entire removal of the tonsils for almost every conceivable infirmity, and frequently from self made diagnoses.

It is not surprising that mistakes in diagnosis have been made by the laity, when we note that "rheumatisms" have proved on more careful medical study to have been classified as syphilis, neuritis, flatfoot, pellagra, arterio-sclerosis, etc.

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*Candidate's Thesis Recommended for Publication by the Council.

Shambaugh of Chicago, one of the most eminent of American laryngologists, in his public utterances and published articles, does not decry the reckless removal of tonsils, and yet he states in one article, that one must not omit the precaution of emphasizing the fact to the patient about to have his tonsils removed, that the operation may have no influence on his disorder. His private utterances, however, suggest that a large percentage of tonsils should only be removed under exceptional circumstances.

During the past ten or twelve years, I frequently have had children brought to my office after operation on the tonsils by the mother, to be told—"my child is no better," and after hearing his many times and reading the unexpressed thought—"we wish you would repay the expenses we have been put to," I began to inquire of myself, if there was not somewhere an explanation of this surgical failure. My inquiry has taken me to many places and made many interviews with some of the internationally famous laryngologists, and my final conclusion is that the evidence points to an interrelation of the tonsil with the ductless gland system, and that the failure to recognize such relationship helps to explain to my mind at least, the cause of failures, such as have been encountered by myself.

I do not wish to decry the value of the removal of tonsils in properly selected cases, but I do wish to say that my belief is that there is a well founded physiological interrelation between the tonsils and adenoids, and the ductless glands, and think that the signs of disfunction of the latter, as evidenced in the child and frequently in the parent, should have proper attention, and proper medication first before the child is rushed to the operating room.

We believe, too, that the apparent gland disfunction in many cases, is sufficiently predominant and offers a satisfactory explanation for the many re-infections, colds, etc., seen in a large number of children, grouped under the so-called "Exudative Diathesis" by Czerny, Lyman, and others.

It is largely to this type of children, who have a history of beginning life with an eczema, drippy watery noses, asthma, who have difficulty in digesting milk, fats, carbo-hydrates, eggs; who may have big heads and big bellies, fat pads, are slow in their mental development, and who may have signs of spasmophilia, or on the other hand, may be precocious, sway-backed, flat footed, have winged scapulae, thin, velvety, or dry skin, deformities of

the ears, high arched palate, sex organ deficiencies, and perhaps other signs of status lymphaticus, that our attention, therefore, is particularly directed.

We must include in the above, the sign of slight hypo-thyroidism set forth in McGarrison's recent work, "The Thyroid" —i. e., "infatile constipation, unusual coldness of limbs; failure of fontanelles to close with normal period, slowness in learning to balance the head or sit up: delayed eruption of the teeth, and their malformation, early caries of the milk teeth, lack of vivacity, intelligence and slowness to learn to smile, somnolence, lordosis, scoliosis, slowness to walk, small and weak muscles, mouth-breathing and snoring, adenoids and lymphatic enlargement, slowness to talk, rickets, tetany, neurosis, poor luster and growth of hair."

McGarrison in his book, quoting from Leonard Williams, (Encyclopedia of Medicine, Surgery-London 1912, page 265) summarizes his views as follows: "Adenoids and enlarged tonsils occur in children who have an inadequate supply of thyroid secretion. The hypertrophic condition in each case is apparently the result of an endeavor on the part of the organism to supply an internal secretion as nearly allied as possible to the one which is lacking. If the hypertrophy is not very pronounced, and if it has not been very long in existence, great enough and protracted enough, that is to produce complications, such as disease in the tonsils themselves, or in the ears, then the exhibition of thyroid extract will cause their regression."

Janney (Santa Barbara) in a personal conversation said he had during his metabolic studies in Southern Germany and Switzerland, noticed among sporadic and endemic types of Cretins, the frequent occurrence of tonsils of enormous size, frequently meeting in mid-line, without any signs of inflammatory disturbance.

The giving of thyroid extract brought about marked reduction in size and frequently almost complete disappearance of the tonsils.

Otts—(Alienist and Neurologist—1913—page 116, 120) reports some interesting experiments with the powdered dried tonsil of the calf, and the evidence from the experiments "suggest that they (the tonsils) yield to the blood a hormone which influences the contractility of involuntary muscles (uterus) and the blood pressure and possesses also a powerful dieuretic action." (McGarrison).

The frequent rather marked hypertrophy of other lymphoid structure in Waldeyers ring, i. e., lingual tonsil and lymphoid masses behind the posterior faucial pillars—following the removal of the tonsils (complete enucleation) and the frequent filling in of the tonsillar spaces with lymphoid masses free from crypts —as mentioned by Bordley of Baltimore, as well as the persistent and oftentimes protracted vaso-motor and vaso-trophic changes seen in the pharynx and nose following operation, particularly in the exudative or anaphylactic type—above described—suggest strongly nature's effort to give to the economy a needed substance which surgery has removed. And the fact that the exhibition of minute doses of thyroid overcomes many of these symptoms lends support to this view.

The writings of Burt Shurley, S. P. Beebe and many other writers, deal with the relationship of acute infection of the nose —nasopharynx, and particularly the tonsils, to hyperthyroidism with or without exophthalmos—though Shurly calls attention to certain pathology in the nose itself—present in hyper and hypothyroidism.

While it is a well known fact that a case of simple goitre may be changed over night into an active hyperthyroid, through a sudden acute infection or a sudden shock, the fact of the patients having been probably a hyper-hypothyroid of years standing, with parents perhaps of thyroid instability—is, I believe, frequently lost sight of, if considered at all, in this tonsil-ductless gland relationship.

That the recognition of the slight thyroid deficiency in early life, and the treatment thereof, might alter or prevent the advent of hyperthyroidism with exophthalmos—is evident.

Jules Glover (Paris) has called particular attention to the type of child presenting vaso-motor disturbances of the nose, with watery discharge, and associated with recurrent swelling of the tonsils, unaccompanied by any signs of bacterial invasion and no increase in the bacteria normally found in the nose or on the tonsils. He also calls attention to a vaso-motor condition of the nose following the removal of adenoids—in subjects with sub-normal pulse and temperature and signs of arrested development or general dystrophy. He finds the giving of thyroid in combination with phosphoric acid and with occasionally the addition of an extract made from the tonsil, results in marked improvement of the vaso-motor condition, as well as improvement in general conditions and reduction in the size of the faucial tonsils.

Harvey Cushing ("Pituitary Body"—page 247), says: "In view of the unquestionably close relation of many states of dyspituitarism—particularly those of primary glandular insufficiency —to lymph hyperplasia (status thymo-lymphaticus), it is quite probable that there may be a *tendency toward adenoid* formation in the pharynx, irrespective of the pressure of a pharyngeal rest."

Citelli, who has produced more readable articles on the relation of adenoids to the pharyngeal hypophysis and central hypophysis in dyspituitarism—than any living laryngologist, seems to have proved by his anatomical studies of the region of the pharyngeal pituitary, and central pituitary, an anatomical connection between the two—a cranio-pharyngeal canal—occurring not infrequently in subjects showing a large adenoid development. His histological studies have convinced him of a hypersecretion of the pituitary in several of the cases studied.

As a result of these studies and clinical observations he has called attention to a psychic syndrome occurring in childhood, and adolescence which may be complete or partial, as follows:

1. More or less marked deficiency of memory.
2. Somnolence or sometimes insomnia.
3. Intellectual defects.
4. Difficulty in fixing the attention.

He has found that some of these cases improve after removal of the adenoid but finds the addition of pituitary extract feeding gives better results.

Among case reports, he mentions a man of thirty years of age, complaining of "heaviness in the head, loss of memory, sleepiness." Examination—adenoids, hypertrophy of lower turbinates, nasal stenosis. Improvement in thirty days on pituitary feeding, without operation.

Another case—boy of fifteen—adenoids, loss of memory, sleepiness, intellectual torpor, aprosexia, weakness in legs. Removal of adenoids but after 40 days little improvement of psychic symptoms. Then pituitary extract; soon great improvement.

Caliceti writing on "Hypophysary Feminism in Adenoidal Subjects" seems to confirm the views of Citelli.

Remarks.

Whether the presence of adenoids in these cases causes the hypophysary symptoms or results from infections of the post nares or adenoids primarily, does not seem a settled question. It would seem to me from a careful study of Cushings' cases, and my

own, that there are evidences that the state of (status thymo-lymphaticus) was either acquired very early in life, or was due to hereditary conditions, and thus the large size of the adenoids is simply an index of the dystrophy present.

Spolverini—writing about a series of nineteen cases of asthma, seen in children, whose ages varied from six to ten years, says: "These children all showed more or less hypertrophy of the superficial or deep lymphatic glands, accompanied by tonsillar or pharyngeal hypertrophy, occasionally splenic or other tumefaction, pallor, facial eczema, low arterial pressure, etc. In other words, a status lymphaticus!

Haven Emerson, commenting on quite a large number of autopsies done on status lymphaticus adults, mentions the enlargement of lymphoid structures—the faucial, pharyngeal and lingual tonsils, and states definitely that these cases are especially prone to be over-whelmed by acute infections.

Ewing—"Military aspect of status lymphaticus" says in infants, and before puberty, lymphatic hyperplasias, large thymus and signs of rickets are prominent, as well as hyperplasias of the lymphatic tissue in the tonsillar ring, intestine, (Peyer's patches) and spleen."

Schlutz and Larson in "Anaphylaxis and its Relation to some Diathesis common to Infancy and Childhood" have, as a result of their experimental work with guinea pigs, come to the final conclusion that "in at least one type of cases studied (inflammatory exudative diathesis, Czerny) definite anaphylaxis to foreign proteids exists, and probably the majority of the phenomena occurring in the condition, are truly anaphylactic."

During my studies of the past three or four years, I have tried to discover the underlying factors, which help to explain the anaphylaxis occurring in hay fever and asthma, and it seems to me, that such phenomena are more prone to occur in individuals of the status lymphaticus type.

This type of individual (exudative diathesis) should be properly classified among the "vagatonies" and he fits in well with the understood description of status lymphaticus." In addition to other physical signs "he does not stand the stress of life, he is not a good soldier, withstands infections poorly (as shown in the recent pan-demics of influenza) and is easily overwhelmed by shock, whether from shell fire, food, animal hair or pollen proteins. His blood picture in a very large percentage of cases, shows a neutrophile eosinophile increase.

Therefore, this type is entitled, in our opinion to a careful hunt for the causes related to the anaphylaxis before surgery is resorted to. It goes without saying, however, that any focal infection, whether of the ear, nose, throat, teeth, gall bladder or appendix should be removed, wherever found.

During the past year or so, I have seen some twenty-five children from three to fifteen years of age, in addition to a fair number of adults, who have come with the histories of hay fever, asthma, and cold catching, non-bacterial type. Most of these cases had their tonsils and adenoids removed prior to seeing me, and in none of these children had there been any improvement in their hay fever, asthma, or "colds."

Few of these children were found sensitive to foods, twenty-five per cent. of the asthmatics have been found sensitive to animal hair protein, principally horse-dander. Several to the orris root or face powder, a few to pollens, and some gave no reaction whatever.

The following cases may be of interest:

Case 1. Child of four years—born at eight months, had a great deal of disturbances in early life from foods, was on a very carefully selected diet when I saw her.

Examination showed a serous catarrh of both ears, of two or three weeks duration; a large adenoid and moderately sized tonsils. Opening both ear drums several times and treating the nose and throat did no good. The adenoids and tonsils were removed—the latter only on the insistence of the pediatrist. Improvement for a few days and then the ears were as bad as ever. A more careful study showed the child anaphylactic to orange juice, which was in her dietary. On removing this the ears cleared up in twenty-four hours, and the child has had no recurrence in one year.

Case 2. An adult—about thirty-five years old, seen four years ago, during my active service in the Southern Pacific Railway Hospital for recurrent attacks of colds, watery in type—and serous catarrh in both ears. I had Dr. George Willcutt open both ear drums repeatedly. He straightened a deflected septum and removed the tonsils without effect. The patient was then investigated for dietary disturbances and was finally found sensitive to potatoes. These were removed from his dietary and the ears cleared up. Two years later a similar attack following eating potatoes which cleared up on removing the cause. This man had a thin delicate skin—feminine in type—hair distribution also feminine in type, and shaved infrequently. He could be classified as a status lymphaticus type. His case is mentioned, as well as the preceding, to illustrate the need of careful study before operating. I am not the only one guilty of having followed an opposite course, which I might say in extenuation, was very early in the protein sensitization testing.

Case 3. A boy—fourteen—was put in the hospital for removal of his tonsils—principally because he had colds and because he was backward in school, and the operation had been advised by the family physician. I did

not see him until he was under the anesthetic. Some cheesy material was found in his tonsils, otherwise nothing of moment about either the adenoids or tonsils. The boy looked like a little old man—face was oldish—he had very dry skin, was thin, sex organs the size of a five year old. He was somewhat backward in school—but very fond of outdoor sports. He only had erupted four of his second teeth and x-ray examinations showed the congenital absence of six of the second teeth germs, and all the rest of the second teeth were unerupted and are scattered around in various directions in his jaws. What teeth he had were the baby teeth, except as noted.

He was not seen for several months following the operation, when the greatest changes were noted. The senile look had disappeared, the skin had become normal in texture and color—sex organs normal for age, except for feminine hair distribution. No change in teeth and no change in desire for study—twenty pounds gain in weight. Whole pituitary has been given with some apparent improvement, and some thyroid, but neither have been taken with any regularity, perhaps due to parental indifference or lack of belief in the necessity of treatment. Both parents show signs of ductless gland deficiencies.

COMMENTS.

The results in this case are rather striking and unusual, especially the stimulation of growth of sex organs. The latter is hard to explain on any other basis than either the removal of an infection in the adenoid or relief of pressure on the pharyngeal pituitary from the adenoid. The improvement in metabolism is probably based on the removal of an infection in the tonsil —which had a further influence on a hereditary hypo-thyroid subject.

Case 4. Boy, age thirteen—rather tall for his age—unusual sex organ development. *Blood* picture, Polys. 54%, Lymphos. 33%, L. Monos. 2% Eosinophiles 11%. Gives a history of asthma first beginning at the age of nine months, apparently following pneumonia and pleurisy at this time. The asthma has only occurred at long intervals and curiously only when there was a cat in the house.

For three years prior to September, 1919, when Admiral Rodman's fleet arrived, there had been no asthma. The gift of a cat from one of the officers brought on violent asthma.

On one occasion three years ago, had a severe attack of hives, following playing with a cat. No asthmatic history in family. The history shows that teething, talking, walking and school progress was normal. No apparent nervousness and the boy is quite even tempered. He has lordosis, flat feet, prominent scapulae, long thorax, drop ears, high arch, palate, deflected septum and irregularities in teeth, slightly dry skin, unusual sex organ development. *Tonsils and adenoids have not been removed.* Eating rolled oats gives him hives, so mother says—and eggs disagree. Skin tests for these are negative. He was tested with all foods, bacteria, some pollens and animal hair, and proved to be sensitive to cat hair, crab, veal and ray grass. He was given immunizing doses of cat hair protein, the cat was sent away, and as the boy was apparently thin for his age and height, was put on small doses of thyroid extract.

The net result for eight months is: No asthma, infrequent colds, gain in weight of fifteen pounds. Tonsils and adenoids appear reduced in size and without surgery.

Case 5. Boy of fourteen—5 ft. 3½ ins. in height—weight 106 pounds, blood picture Hg. 90%, Ply. s. 42%, Lymphs. 45%, L. Mono. 3%, Eos in 10%. His mother's emphatic announcement to me was "all my boy's troubles have followed the removal of those damn tonsils!" The history briefly is: Was bald until one year old. Had frequent colds. Tonsils partly removed at the age of seven; after that bronchitis began to develop and severe sneezing colds occuring with great frequency during the year. In January, 1919, he had influenza. Following this asthma developed. In April, 1919, the tonsils and adenoids were re-operated and the lower turbinates partly resected to relieve the sneezing and asthma; without benefit.

His mother says he was slow in every way except in his school work. His personality was somewhat of a supercilious makeup, rather irritating in type.

Examination showed a deflection of the septum with hypersensitive tubercle of the septum, nothing else in the nose and throat. He had flat feet, lordosis, prominent scapulæ, sex organs very undeveloped for his age. He was put on anterior lobe pituitary extract—grs. IV daily. A few days of this gave him some headache, insomnia and nausea. The dose was reduced to ½ gr. daily and in a short time increased to IV grs. Locally—2 drops of 95% alcohol were injected into the tubercle of the septum (both sides) which seemed to relieve the sneezing for a few weeks, but returned in about six weeks.

The pituitary extract has been continued to date (seven months) and the result is that the asthma seems to have stopped, the sneezing gone and the cold catching tendency vastly improved. He has had but two severe attacks of asthma during this period, one of which appears associated with eating a lot of indigestible food—the other, with an attack of bronchitis. Sex organs have begun to develop in a very satisfactory way, disposition has improved. He is in the hands of a gymnasium teacher, to be taught proper breathing and exercises to strengthen his abdominal and back muscles, and there is every hope of making a fairly normal young man.

Conclusions.

Physico-chemistry has to do with the origin and evolution of life, and if the chemical "actions, reactions and interactions" in the human body are controlled by the various ductless glands, then any alteration of the chemical interactions in the body may bring about disturbances of the body growth, and disturbances of metabolism.

Inasmuch as the thyroid appears to be the great regulator of metabolism and particularly of carbo-hydrates and as disturbances of metabolism as well as disturbances of the automatic nervous system are outstanding in the anaphylactic type of individual, we believe such evidence of pathologic physiology should influence the medical man of today to a more careful study

of the patient before ordering surgery directed to the nose and throat, that may result in harm, and do the patient no good.

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THE METHOD OF TONSILLECTOMY BY MEANS OF THE ALVEOLAR EMINENCE OF THE MANDIBLE AND A GUILLOTINE (THE AUTHOR'S METHOD). ILLUSTRATIONS SHOWN AT THE TIME OF PRESENTATION.

By GREENFIELD SLUDER, M. D., St. Louis, Mo.

On June 9, 1910, I presented this technique to the American Medical Association at its meeting in St. Louis, Missouri. I gave the description complete; showed tonsils removed by it; gave the anatomical basis on which it rests, complete; showed jaw bones in various stages of development; and exhibited patients who had been operated upon by it; and made the claim for it of 95% perfect results. On September 17, 1910, Drs. Whillis and Pybus of New-Castle-on-the-Tyne published in the "London Lancet" the same operative procedure, claiming 50% for it. They did not give the anatomical basis on which it rests. My text was delayed in publication by the fact that I loaned my drawings to Dr. Wm. L. Ballenger to use in his text book, then in preparation. He agreed to photograph them and return them to me in twenty-four hours. They were returned from his publisher ten weeks later. By this delay my manuscript could not be published in the "Transactions of the Section on Laryngology, Otology and Rhinology of the American Medical Association, 1910", and was declined by the "Journal of the American Medical Association" as a communication presented at its "Meeting, June 9, 1910". The "Journal", however, accepted it for independent publication March 25, 1911. The record of its presentation at the "Meeting, June 9, 1910" is given in an abstract of the "Proceedings", published July 2, 1910, Journal of the American Medical Association. Some recent British authors seem ignorant of this fact, and assign priority to Drs. Whillis and Pybus. I feel that the anatomical basis on which the procedure rests should also be recognized, as it is absolutely necessary for the highest percentage of perfect results (99.6%).

The description of the operative procedure given June 9, 1910, has never been altered. Practice has, however, evoluted some trifling points and involuted others; to wit, now I always secure the lowermost tonsil tissue first, and then rotate the fenestra to include the uppermost, as shown in these pictures. I do this because in the effort to secure both poles at once some of one or the other may escape. I have also emphasized the necessity of the last

move of the guillotine being backward, outward, and *downward*, and for greater security (operative accuracy) I have increased the angle at which it crosses the mouth. The description of this move is simplified by the instruction, "Point to the shoulder".

The details of the formation of the "Alveolar Eminence of the Mandible," and the "Operative Procedure" are to be found in my first presentation of this technique, "Journal of the American Medical Association," March 25, 1911. The guillotine now used is supplied with a "thumb lever" for giving power in cutting through the tissues. It is operated by the surgeon's thumb as soon as he has put the tonsil completely through the fenestra and the blade pushed down to close it. It does not necessitate removing his finger which is holding the tonsil through the fenestra. All other power devices that have so far been attached to the guillotine for this purpose require more or less changing of his hands, which is a disadvantage because some of the capsule often slips out under the blade in this procedure, no matter how careful the surgeon may be to prevent it.

This instrument was presented to the Southern Medical Association, Nov. 12-15, 1917. Southern Medical Journal, May 1918.

Since the presentation of this technique in 1910, I have had much experience in teaching it to laryngologists of all degrees of professional acumen, and very soon learned that the general impression they had of it was that it was very simple and easy, which is not true. It must be carefully learned. The majority have felt that they ought to do it by virtue of their desire to do it. Very few had read the description of the alveolar eminence or the operative procedure; and so I have realized for a long time the desirability of giving an adequate description of it. A number of friends of this technique have written about it, and from time to time supplied illustrations; but the complete procedure accurately portrayed step by step has not heretofore been given.

An accurate knowledge of the anatomy of the "Alveolar Eminence of the Mandible" is necessary for highest percentage (99.6%) perfect results.

DISCUSSION.

Dr. Wm. E. Sauer, St. Louis, said this method had been generally adopted in St. Louis and the Middle West since 1910. As to 99.6 percent results, they had not reached that figure. In cases that had had frequent peritonsillar abscess the method was not available, but it applied to the vast majority of cases. Many men used local anesthesia, but the speaker said he had recently abandoned this for gas which he found more satisfactory.

Dr. Jos. C. Beck, Chicago, said he was fortunate in being associated with Dr. Ballenger at the time when this operation was presented. Dr. Ballenger was its first advocate, but he was a poor teacher of the method. The early work of Sluder was to bring the tonsil forward. Dr. Beck said he raised the tonsil through the supra tonsillar fossa and snared it off through the ring. There were other methods as good as the guillotine, but the Sluder technic was best. In regard to priority, he was not aware that other men had claimed it for this method, but believed that all credit had been given Dr. Sluder.

Dr. Richmond McKinney, Richmond, Tenn., said that he had been using this method for five years and was highly satisfied with it. He had given up using adrenalin. He found that the Sluder instrument picked up any remains. In his general hospital service he had been using gas exclusively and found it satisfactory.

Dr. Wm. Wesley Carter, New York, said that he could testify to the efficiency of this method which he had used since 1913 in 9804 tonsillectomies, with probably 95 per cent. cures. There were two deaths, both proved at autopsy to be due to status lymphaticus. One point should be emphasized, that was putting the instrument low in the pharynx before engaging the tonsil, so that the lower lobe was not missed.

Dr. Hanau Loeb, St. Louis, said that the saying that a prophet was without honor in his own country, did not apply to Dr. Sluder as his method was used in St. Louis, almost exclusively. The speaker had discarded general anesthesia and used local. Sometimes a complete operation could not be done the first time, but it could be obtained at the second attempt. As far as priority was concerned, Dr. Sluder had worked out this method long before he published it. It appeared ridiculous at first, but time proved it was right.

Dr. Lyman, St. Louis, said that either local anesthesia or gas could be used, preferrably gas. Lung complication cases had always been those where ether was used. Nitrous oxide gave 99 per cent. good results. Another point was the lack of fluid intake in these patients, because of painful swallowing. The patient's head could be grasped by the sides so as to put traction on the neck muscles and he could drink without pain. In this way water could be forced and toxemia controlled.

Dr. Jos. C. Beck, Chicago, asked the speaker to demonstrate his method.

Dr. L. W. Dean said he had tried this method on 60 patients with great success. It was very simple.

Dr. Thos. Hubbard, Toledo, Ohio, asked the opinion as to the Leland knife where the tonsil was deeply buried. It was difficult to grasp such a tonsil without separating the tissues.

Dr. George L. Tobey, Boston, said that recently they had had an epidemic of tonsillectomies among the profession, and the best panacea for postoperative pain was 25 grains of Bayer's aspirin in half a glass of water, used as a gargle and to be swallowed. By the next day all pain had disappeared.

Dr. L. D. Alexander, New York, asked what method left least scar tissue. He had not seen more scarring one way than another. In regard to post anesthetic thirst, it was his custom to order a sodium bicarbonate enema, followed by a Murphy drip, this removed thirst and replaced fluid. In regard to gas he found that gas anesthesia increased bleeding. Was that the experience of the other members?

Dr. George L. Richards, Fall River, asked if there was more traumatism by this method. One operator whom he had seen use the Sluder technic produced a great deal of trauma. In Dr. Beck's method there was less bleeding and less trauma.

Dr. Thomas E. Carmody, Denver, Colo., said he had used this method for a number of years and found it very satisfactory. The ring should be put deep into the pharynx to get the lower lobe, or one was likely to miss it. In regard to pain, the speaker said he used orthoform.

Dr. George F. Keiper, Lafayette, Ind., asked if Dr. Sluder picked up bleeding points and tied them after operation.

Dr. Wesley C. Bowers, New York, asked Dr. Sluder if he was able to remove the lymphatic tissue at the base of the tonsil by this method as he personally had never been able to do so, and yet he considered this tissue as dangerous as the infected tonsil. He snared this off after the Sluder operation.

Dr. Jos. H. Abraham, New York, said that not a month passed but he was called upon to operate on conditions which existed after the Sluder operation had been practiced. He operated entirely by the dissection method. Recently he had operated on a lady and her child, from St. Louis, they were familiar with the Sluder technic and also with his own, and they came to New York to be operated.

Dr. Greenfield Sluder, closing, said that Dr. Sauer spoke of 99.8 results, this was stated in consideration of the fallibility of human nature, but if not for politeness he would raise that and claim 100 per cent. If the patient's head were turned to the shoulder one could take off the small masses, even in peritonsillar infiltration. The speaker had emphasized this point at the A. M. A. In regard to anesthesia, he had used both local and general and in some cases had simply opened the patient's mouth and taken it out. In regard to capsule splitting, it was inconceivable to him how there could be any splitting after the blade had been driven through. In regard to the snare versus the guillotine, one could not tell, in looking at the tonsil afterwards, which had been snared and which guillotined. In regard to Dr. Beck's remark, the technic was never changed from the first. In regard to hemorrhage, bleeding under slow snaring with ether anesthesia was negligible, but secondary hemorrhage was frequent. The guillotine blade could be used as a hemostat. In regard to nitrous oxide, this raised blood pressure. Hemorrhage was instantaneous, and if one could not operate by touch, the blood obscured the field. Secondary hemorrhages following gas were less frequent than those following ether. Gas was used by the speaker unless there were contraindications. In regard to priority the speaker said he never took the matter seriously until his name was omitted in a text book and an English author's credited. In regard to local anesthesia, he had to teach this method to the Navy classes, as they were not able to work with general anesthetics. In regard to the guillotine, patients stated that it was the most comfortable method of operating. In regard to fluid intake, Dr. Lyman's method was a very valuable measure. In regard to the knife, it should be used for projecting, rather than for unbilicated tonsils.

Dr. Sluder said that tonsils develop in two halves, the lower part may be the greater, and the upper part invisible, tucked into the supra tonsillar fossa. This was deceptive to the operator, but loosening of the pillars was never necessary. The hump of the instrument pushed the tonsil through. Dr. Alexander referred to scar tissue,—the scar from one operation well done was identical with that of another. Dr. Richards spoke of trauma,—of course it would be possible to traumatize, but one could do as much damage with the knife as with the guillotine. Dr. Abraham evidently had seen some very poor operations.

but that was the operator, not the technic. The plica triangularis was proven specifically to be a part of the tonsil, projecting inward and backward from the tonsil. It would be a mistake to leave it. In taking it out one might bite a few fibres of the palate-glossus, but there was no other instrument that could remove so clean a specimen of the tonsil as the guillotine could.

AN ANALYSIS OF OVER FIVE HUNDRED CASES OF PROGRESSIVE DEAFNESS.

By HAROLD HAYS, M. D., New York, N. Y.

My intense interest in the diagnosis, treatment and general welfare of patients who have consulted me privately because of defects of hearing, has led me to study very carefully the histories of those patients, particularly within the past five years, in order to find out whether an analysis of their histories might not lead me to more definite conclusions as to the present status of our treatment, so that I might, therefore, be able to be more honest with myself as to the promises I could make them. It is a source of satisfaction to me to feel that otologists in general are more interested in the subject of progressive deafness than formerly and that they are getting away from the old, empirical methods of treatment which, often, did more harm than good.

What a change has taken place during the past ten years since we have been able to make more exact interpretations of conditions because of our more accurate methods of diagnosis! I refer particularly to the more careful inspection of the nasopharynx, especially the regions of the Eustachian tubes, brought about by the invention of that clever instrument, the Holmes' nasopharyngoscope. One need no longer conjecture. A little time and patience is all that is necessary to get a definite concept of the picture that is present. Again, the use of the electric otoscope, to which can be attached a massage apparatus, forms a valuable adjunct to our armamentarium for by its means, one is able to tell the exact condition of the membrana tympani, how much of the drum is rigid or relaxed, how much actual limitation of excursions of the drum there is, which may be accountable for a further progression of the symptoms.

For purposes of actual analysis, this paper should be statistical in nature but statistics are dry, inaccurate and often misleading. But the general conclusions at which I have arrived will, I feel, prove of interest. Having been able to follow many of these cases for a number of years, I am in a position to make more positive statements than if the patients had not been private ones.

Etiological Factors. A careful inquiry had been made in most cases as to the members of the family having had any trouble with

their ears. We speak of hereditary deafness but such a term is misapplied in any case in which deaf-mutism is not directly traceable through a family for generations. But that there is a hereditary predisposition to a weakness of the ear mechanism, cannot be doubted although it is not present as often as is generally supposed. In the cases under consideration, very few of the patients knew of others in the family who were hard of hearing. In a small percentage, more than one member of the family was under treatment at the same time and in a few instances, three or more members of the immediate family were deaf. It is my opinion that we should not consider the hereditary tendency of the disease as of much value in the majority of cases but that where we do find a number of members of one family suffering from this same trouble, we must advise strongly that there is great possibility that future members of the same family will have to be extremely careful of their ears and may transmit the auditory weakness.

There are two classes of cases which deserve particular attention: 1st. Patients who have had exanthematous diseases and, 2nd, the recurrent colds which are so often associated with diseased tonsils and adenoids. The chief exanthematous diseases are measles and scarlet fever. If one makes careful inquiry, he will find that the majority of cases of progressive deafness, which belong to what one might call the hopeless class, have had one or both of these diseases and that frequently there was ear trouble at that time. This brings up an important point which has been emphasized by Kerr Love and others, that few of these patients have had any attention paid to their ears after the acute symptoms of the disease or the ear discharges have subsided. Inquiry among these patients shows that, at the time of the scarlet fever, for example, the ears were well taken care of, if there had been any inflammatory reaction present or if there had been any suppuration. But seldom were the ears examined after the children went to school again, even if the family had noticed that their hearing was not as perfect as it had been before. Oftentimes, the deficiency of hearing was not sufficient to cause any apprehension, either on the part of the patient or on the part of the parents until, perhaps, the age of puberty. There is no doubt in my mind that an insidious process had been going on for many years and that if proper examinations had been made it would have been possible to correct the condition. From the data that we have in hand from these cases and from the assertions that have been made by others, one is forcibly impressed with the fact that the most important treatment of progressive deafness is pre-

ventive treatment. I am of the opinion, more than ever, that most deafness is preventable and that it is the duty of the otologist to impress this fact upon the public.

The frequent repetition of colds in childhood is intimately associated with the question of the removal of tonsils and adenoids. Most of the cases under consideration had had their tonsils and adenoids removed at an early age. In many cases, the operation was imperfectly performed and in a number of instances had to be done over again in adult life. Most of these patients give a history of repeated earaches in childhood which must be seriously taken into consideration. But, I believe, that it is wrong to make a definite assertion that the removal of the tonsils and adenoids alone, will be sufficient to clear up any tendency to ear troubles later on in life. An analysis of these cases shows plainly that there are many other factors, among which may be mentioned intercurrent diseases, which bring about a devitalized condition of the child so that it is prone to a chronic inflammatory condition of the mucosa of the nose and throat. Much as we feel that the proper elimination of tonsils and adenoids will bring about the results we desire, there are too many instances in which we find that their removal has not influenced the ear condition at all. One then has to consider that the puny child who is constantly suffering from an inflamed condition of the nose and throat with diminished hearing, needs to be gone over thoroughly to discover whether, for example, there is not some trouble in the endocrine system or perhaps in the gastro-intestinal tract. It is extremely hard to get at these definite factors. Moreover, it has only been during the past few years that we have had them definitely called to mind. But I am able to pick out isolated instances in the series, in which I am sure that the persistent inflammatory condition in the nose, throat and ear, has been due to some defect in the general system. Moreover, I am so sure of this that in the more careful histories we are taking today and in the more careful treatment we are giving children, we are paying more attention to general treatment and its effect locally than we are to local treatment by itself.

Mention has been made of the fact that complaints of marked defects in hearing are not made until after the age of puberty. In the cases under consideration, although a definite history could be obtained of scarlet fever or some other predisposing factor, it was seldom that the hearing was bad enough to be noticeable and to demand treatment until after the fourteenth year. Whatever treatment was begun then, was given in a perfunctory manner and

did little good. It has been my experience that children at this age cannot be made to appreciate the seriousness of their condition and will use every subterfuge to get out of treatment. Most of my patients have candidly admitted that they either did not have any treatment at this time or else that they were taken to an otologist, once or twice, and then were told to return at regular intervals which they never did. This puts the blame for future trouble on the patient himself, although it is hard to make him see it from that point of view.

By far the majority of patients in this series have had some nose or throat abnormality and, at an earlier date, I collected a series of fifty of these cases to show the intimate relationship of pathological conditions of the nose to chronic catarrhal otitis media. Since that time I have become more conservative and have felt that it was impossible to say, for example, that a deviation of the septum was responsible for the ear condition. It is a fact that almost all these patients have some abnormality in the nose or throat or had such an abnormality which was corrected. But I regret to say that the correction of the nose and throat trouble has not by any means improved the hearing.

For some years I hoped that this would be so, but a proper analysis has shown me that oftentimes the damage has been done so completely before the patient came to me that no amount of operative interference could correct it. In looking over these histories, I find that there is a deviation of the septum or a sinus condition or some disease of the tonsils or some adenoid tissue in almost every case. And if such a condition is directly connected with some pathological condition of the Eustachian tube, which seems to me to be continued because of the nose and throat abnormality, I advise that an operation should be performed; if, on the contrary I can see no connection, I do not hesitate to advise that no operation should be performed. It is my opinion that most of these patients have suffered from too many operations upon the nose and throat and that they have just cause for the feeling that their condition has been made worse because of too much meddling.

Symptoms. Naturally, the symptom that most of these patients have complained of is deafness in one or both ears. In the majority of cases they have felt that one ear is worse than the other, but careful tests have shown that the hearing is often worse in the ear of which they complain the less. About 50 per cent. of the patients have complained of tinnitus which varies in character

and degree. In the more advanced cases, the complaint of the tinnitus has been more than the complaint of the deafness. It is difficult to determine when this tinnitus has first come on, but, as a rule, it is the forerunner of the complaint of deafness. But this does not mean that it has preceded the deafness. It is only that the deafness has not been of sufficient degree to be noticeable until after the tinnitus has made itself evident. It is my firm belief that, if the majority of these patients had been properly treated at the time that they first noticed the tinnitus, a great deal could have been done to prevent further trouble. Paracusis has only been present in the more advanced cases, usually in patients who have been treated by a number of physicians over a long period of years. It has been my experience that patients who have paracusis Willisi will not respond to any treatment which we have at our command at the present time. In all probability the paracusis is due to a fixity of the ligament of the oval window which it is difficult, if not impossible, to overcome. Dizziness and nystagmus have seldom been noted except in those cases which demonstrate some trouble more deeply located beyond the middle ear.

There is a certain class of cases which demand our attention and which have not been differentially classified. I refer to patients who suffer from what I have previously termed "intermittent deafness." Such patients will state that their hearing is better at one time than another, is better in one climate or another. Any change in the weather seems to make a great difference in their hearing acuity. Any change in their physical condition seems to make a great difference in their hearing acuity. Over half the patients in this series, under thirty years of age, have, what I call, intermittent deafness. One should pay careful attention to this fact because it indicates that the ear condition is not so bad but what it can be arrested or improved, provided one is able to get at the factor which makes the change in the hearing acuity. A careful examination of these cases shows that in almost all cases the reason for the change in hearing is because the mucosa of the Eustachian tube becomes inflamed at times, while at other times this inflammation subsides and the tube again becomes patent. In other words, the cause of the trouble must be found in the nasopharynx. Many of these patients have diseased tonsils which, as explained by Emerson, set up an irritation in the nasopharynx. Others have adhesions in the fossa of Rosenmuller which are continually interfering with proper muscular

action of the Eustachian tubes. Others have definite abnormalities in the nose, particularly hyperplastic or suppurative conditions of the nasal sinuses. But, by far the majority of them have a polypoid condition of the posterior tips of the inferior turbinates which act directly on the tubal orifice. Some of these polyps are small but hang directly into the tube itself, while others are so large that they block off the nasopharynx completely. Since the examination with the nasopharyngoscope has become a routine procedure in our office, we have been surprised to find that polypoid tips of the inferior turbinate are present in nearly 75 per cent. of the adults who come to us complaining of deafness, particularly of the intermittent type. I cannot too strongly emphasize this point. Moreover, as will be shown later on, it is surprising in how many cases the hearing has been improved after these tips have been properly attended to.

After trying numerous classifications of cases, we have decided that a clinico-pathological classification is the best. By this I mean that the clinical evidence of the condition as evidenced by tuning fork tests and symptoms is joined to the pathological evidence as shown in the middle ear and nasopharynx. In former years, the general term OMCC was used, which meant nothing. Today it is necessary to differentiate the various types of progressive deafness with which we commonly come in contact. We have found it satisfactory to place our patients in one of the groups about to be mentioned.

1. Retracted drum with stenosed tube.
2. Retracted drum with open tube.
3. Slightly retracted drum with a tube which intermittently opens and closes.
4. Slightly retracted drum which, on vibratory massage, shows only slight loss in motion.
5. The relaxed ear drum, associated or unassociated with a retracted drum.
6. Rare cases, such as otosclerosis and nerve deafness.

1. *Retracted drum with stenosed tube.* A large percentage of cases come in the first class. At no time is the tube open unless it is forced open by the passage of applicators or bougies. These cases cannot be Politerized and seldom can be benefited by catheterization.

2. *Retracted drum with open tube.* A small percentage of cases belong to this class. The deafness is associated with an atrophic condition of the mucosa of the nose and throat which

extends up through the Eustachian tubes into the ears. The retraction, in parts, may be associated with a relaxation of the drum. In other cases the drum is held rigid, due to the marked infiltration with connective tissue and the ankylosis between the ossicular joints.

3. *Slight retracted drum with a tube which intermittently opens and closes.* By far the majority of patients, under thirty years of age, belong to this class and can be benefited by proper treatment. The amount of retraction is due to the negative air pressure in the middle ear, and is most often secondary to some condition in the nasopharynx. When this is overcome, and the tube dilated, the drum can be readily massaged and the excursions are about normal. One has to watch these cases carefully because any acute inflammatory condition of the nose and throat immediately shows its effects on the hearing acuity.

4. *Slightly retracted drum which, on vibratory massage, shows only slight loss in motion.* In a goodly percentage of cases, examination with the otoscope attached to a vibratory massage apparatus, will show almost normal excursions of the drum. There may be a few adhesions which hold the drum down in places or there may be a slight thickening of the drum in certain parts. The ossicular joints seem to be freely movable. It is important to recognize this class of cases for it is in them that the vibratory massage, if done with intelligence, will do so much good. Almost always there is an associated condition of the Eustachian tube which needs attention.

5. *The relaxed ear drum, associated or unassociated with a retracted drum.* In numerous papers in the past, I have spoken of the relaxed ear drum which gives rise to what I have popularly called pocket-handkerchief deafness. This class of cases has a definite syndrome. With every act of blowing the nose, the patient has been in the habit of inflating his ears. He has made himself deaf by over inflating his ears and his ears are peculiarly sensitive to all vibrations whether they be sound or not. A very large percentage of cases that were ordinarily called OMCC belong in this class. They must be recognized because they are the cases which should be left severely alone unless one feels that it is worth while to attempt to tighten up the ear drums. Sometimes the relaxation is in certain parts of the drum only and is accompanied by a retraction in other parts due, to adhesions between the drum and the internal wall of the middle ear

or between the ossicular joints. A definite diagnosis of this clinico-pathological entity can readily be made by means of the nasopharyngoscope and the otoscope.

6. *Rare cases, such as otosclerosis and nerve deafness.* No better evidence of the rarity of true nerve deafness can be given than by an analysis of these cases which shows that there were only three cases of nerve deafness out of five hundred patients examined. All three were syphilitic in origin or at least, in all three cases there was a history of previous syphilis. I do not wish to assert that all cases of nerve deafness are due to syphilis. There are other factors, such as meningitis and systemic infections. Yet having heard so much about nerve deafness I am rather surprised to find that there were only three cases in this series. And what is equally as surprising to you, perhaps, I have not seen one case of otosclerosis that I could diagnose clinically. It is about time that we restricted the term otosclerosis. It is used too loosely and has become a by-word in the mouths of the deafened, with the result that a great many patients who are told that they have this condition give up in despair and become hopeless despondents. Not having seen a case of otosclerosis in over five hundred cases of deafness, makes me feel that the condition is very rare, and this is further corroborated by the statements of investigators who declare that a very minimum percentage of cases of deafness examined pathologically, after death, show the lesions of otosclerosis.

Improved Methods of Examination. Our conception of the pathologies of progressive deafness has expanded considerably since the introduction of more precise methods of examination. The cursory examination of the ear drum, with an ordinary speculum and the examination of the nasopharynx with the small rhinoscopic mirror will not suffice. There are three new essential instruments without which the otologist cannot get along—the Holmes' nasopharyngoscope (a great improvement on my original instrument, the pharyngoscope), the electric otoscope with attachments for pneumo-massage of the drum, and the various applicators, sounds and bougies, the best of which are patterned after Yankauer's instruments. [In the earlier cases of this series, we did not have these valuable instruments to aid us in diagnosis, but now that we use them as a routine procedure it is hard to believe that we ever got along without them. Direct inspection of the Eustachian orifice is of most importance and we are amazed

at the amount of information we derive from this examination. The otoscope allows us to ascertain the exact excursions of the ear drum, which is of equal importance. The determination of the character of the mucosa of the Eustachian tube can only be properly determined by the passage of applicators, sounds and bougies through it. The information that can be derived from such a procedure I described in a paper read last year before our State Society.

Value of Tuning Fork Test. Tests of hearing acuity by means of tuning forks as well as by the watch, whisper and spoken voice are a part of our usual procedure. But the more I have recourse to such examination, the less value I place upon it. Not for one moment would I give up these tests in order to differentiate the kind of deafness that is present in order to make comparative observations, but the personal equation enters into the tests to a great extent. But what is most importance, the amount of improvement which the patient derives from treatment cannot be measured by instrument but only by his own interpretation of the amount of improvement that has taken place. I am not as anxious to know whether the tuning forks show any improvement in my patient's hearing as I am in knowing whether he feels that he is hearing better in the practical every-day life that he leads. In analyzing this series I find that in many cases the patient thinks that he hears better although my technical examination shows no improvement. A considerable number of these patients have stood by me for years and they are content that I can keep them from getting worse. From my own personal point of view I am not satisfied but the patient is and that is what counts in the end. There is no instrument that I know which is is an accurate test of hearing at the present time, unless we accept the audiometer which Dean has described.

Prognosis. The cases in this series divide themselves into two classes, patients moderately deaf and in whom there is some hope of improvement and cases that are hopelessly deaf from the medical point of view. More of the latter class are consulting me year by year, perhaps because the otologists of the country are using me as a court of last resort. Mental reconstruction of the deafened is becoming more and more the duty of the otologist and this latter class can be handled only in that way. The prognosis, therefore, depends upon the type of case one is treating. I believe that the results I am beginning to attain in the mildly

progressive type of case, means a great deal for the future. I know that I am getting better results than I did as short a time as three years ago. I feel that the future is full of promise if the otologists of the country will delve into this problem with the same thoroughness with which they have handled all other problems in their field. First of all, the prognostications of the future will depend on how much educational propaganda can be spread about so that the proper preventative measures in early childhood will be used. Secondly, otologists must be impressed with the fact that a proper clinico-pathological picture must be revealed before any attempt is made at treatment. Thirdly, we must get away from the time worn idea that inflation of the ears is the only treatment. The prognosis of the so-called hopeless cases will depend upon our ability to make these patients take up lip reading at the earliest opportunity. That is the salvation of these patients.

Treatment. It is not my purpose to outline any definite treatment as the result of my careful perusal of these cases. The most important thing to my mind, is that I have become more and more convinced that the only hope of relief lies in the proper attention to pathological conditions of the nasopharynx which exercise any influence on the Eustachian tube. Tubal patency is of the utmost importance and must be permanently, not temporarily established. Having assumed that everything of an ameliorative nature, be it operative or otherwise has been attempted, there is often still a degree of inflammation at the orifice of the Eustachian tube, or in the tube itself, which must be overcome. After having tried every kind of medicament, we have come to the conclusion that the high frequency current, properly applied does the most good. The ultra-violet ray may be applied by direct vacuum tubes or one may use the modified nasopharyngoscope which I have recently had made into which can be fitted a fine electrode for fulguration. The vacuum tubes are made on the same lines as a Eustachian catheter and are wound with silk ribbon which is coated with shellac so that, if they break in the nose, no harm will be done. They are inserted into the orifice of the Eustachian tube and the current is applied directly for from five to ten minutes. The results are very gratifying. After one or two treatments, the tube remains open and stays open for a considerable length of time. We have treated about fifty patients in this way during the past six months and in many instances the hearing has been markedly improved with-

out making direct use of dilators in the tube of any kind. The fulguration treatment is of particular value in those cases in which polypoid tips of the inferior turbinates are overhanging the Eustachian orifices and where there are evidences of glandular excresences on the promontory of the tube, in the fossa of Rosenmuller or in the mouth of the tube itself. The current is applied in the same manner as when one desires to get rid of a growth in the bladder. As the fulguration is performed under direct inspection, no harm can be done.

What conclusions can be arrived at as a result of an analysis of this large number of cases? Surely we must feel that the results are not very gratifying as far as cures are concerned. But the future is full of promise. First and foremost we must classify our cases in a different manner than we have in the past. A clinico-pathological classification must be established, as it seems almost hopeless to get a pathological classification by itself. Secondly, we must pay more attention to the etiological factors in childhood and recognize the fact that most of the harm is done before it is discovered, and therefore be able to instruct parents and family physicians more carefully. Thirdly, we must separate those cases for whom something can be done medically from those for whom nothing can be done medically, and give these patients the benefit of our honest advice. It is a sad commentary on our treatment in the past that we have so many hopelessly deaf patients who have to resort to lip-reading to overcome their handicap. Lastly, the newer and precise methods of diagnosis and direct treatment which we feared to use until a few years ago, have become common knowledge and encourage us to feel that in the course of time we shall be able to treat these patients with intelligence and be able to give them honest encouragement.

A DEPARTURE IN HOSPITALS—THE NATIONAL HOSPITAL FOR SPEECH DISORDERS.

By JAMES SONNETT GREENE, M. D., New York City.

As far back as we have any history there have been physicians, and for at least one thousand years we know that there have been people with impediments in their speech—for is it not mentioned in the Bible, in both the Old and the New Testaments, in Isiah, in St. Mark, and in other places.

From that time on to the present, scientific men have considered and written about defective speech, but strange as it may seem, it did not receive the attention it deserved from the Medical Profession, and to date when specialism is the outcome of progressive medicine, defective speech is still a neglected speciality.

Medicine, like all other sciences, has made wonderful progress, the ultimate result being better knowledge and more efficient practice. Our conception of pathological conditions is constantly changing. We discard old ideas,—we get new ones. So tremendous has been the recent advance of medicine that no one man can understand more than a small fraction of it; thus physicians have become more or less dependent on the skill, ability, and specialized training of other physicians for sufficient knowledge to care for patients intelligently.

In the field of defective speech in Europe, before the war, Professor Herman Gutzmann was the outstanding figure. In our country, for years, the late Dr. Hudson MacKuen of Philadelphia, was a recognized authority. Besides these leaders, there have been others, comparatively recently, who have done good work along analytical lines, but it was not generally realized that a person who suffered from defective speech was just as much entitled to hospital care as one who suffered from, as for example, eye, ear, nose or throat trouble.

While we have eye hospitals, nose and throat hospitals, skin and cancer hospitals, and numberless special institutions, we did not have one general specialized voice and speech hospital in the entire United States. By that I mean a hospital devoted solely to the cure of patients suffering from various disorders of voice and speech.

The natural outcome of such a condition—very few men interested in the subject and no special hospitals—compelled that vast army of sufferers to look elsewhere for help, consequently, it was the same as in the old days when venereal diseases were not taken largely into consideration and those suffering were treated through advertisements, in drug stores, museums and other places, by people in all walks of life.

The defective speech sufferers have been and still are going through a similar process. They have been receiving courses of treatment from school teachers, Christian Scientists, Osteopaths, and the very latest is Chiropractic. For instance, a chiropractic professes to cure a stutterer by twisting his neck in single two dollar treatments or he twists it by the case for fifty to one hundred dollars, but to no avail. With it all those having speech trouble still carried their burden and kept on suffering.

These prevailing conditions demonstrated only too clearly for many years the ever growing necessity for some central hospital or organization to help speech cripples and try to make life more livable for them: an institution or hospital whose policy it was to take a very broad view of its duty to all those who came under its care, particularly the poor and neglected: a dignified humanitarian type of institution approved by physicians of the highest ethical standing and irrevocably opposed to quacks and fads.

There seldom is any speech defect that stands alone. Usually it is so intimately associated with other defects, physical, mental, or moral, that in order thoroughly to remove the speech defect the associated defects must be treated also. Therefore, necessarily, the hospital or clinic had to be not only a medical institution, but an educational and social one as well, for it had to raise standards and inculcate good habits of all kinds in its patients.

We definitely realized that there was great need for a cooperative work, one in which there was an intimate relationship between medical, reeducational and social therapy. In other words, a center where the doctor, the teacher or educator, and the social worker, were represented in complete harmony.

About three years ago, The New York Clinic for Speech Defects, which has since changed its name to The National Hospital for Speech Disorders, was founded. During that time over three thousand persons have applied for treatment. They have come from every state in the union. Children and adults came suffering with every conceivable ailment of voice and speech.

They had defective speech conditions due to harelip, feeble lips, cleft palate, relaxed palate, jaw conditions, (protrusions or recessions), teeth anomalies, tongue conditions; various voice abnormalities arising from palate or laryngeal conditions such as nasality, aphonia, hypophonia, phonesthenia, falsetto voices. Again, conditions of stuttering, stammering and lisping, deaf mutism, audimutitas and idioglossia. We have seen numerous patients with diseases or conditions of nervous origin giving rise to various disturbances of speech, such as agitophasia (speech agitans), imbecility and idiocy, hereditary ataxia, progressive muscular atrophy, congenital hydrocephalus, spastic spinal paralysis, bulbar paralysis, syphilis, multiple sclerosis, Bells's palsy, post diphtheritic paralysis; cases of tumors of the speech areas (aphasia), also medulla conditions; epilepsy, chorea, spasmodic tics, hysteria, insanity.

The number of conditions just enumerated will at once show the extensiveness of speech disorders in medicine.

At the hospital, during its period of existence, our patients who came for treatment presented many interesting and complicated speech problems. For instance, let us take the stutterers, of whom we have already treated about fifteen hundred cases.

Stuttering speech is a neuropathic manifestation which has become a veritable obsession of a psychopathic or a psychastenic individual, this state being the result of an unconscious motive, usually caused by the inability of the patient to adjust himself to some difficult situation. The nervous system of such an individual presents a special make up, that of increased irritability with diminished capacity; a system that becomes easily affected from the least cause, and is constantly threatened with a break. If trying conditions occur, lowering his resistance to a given point, then when an emotional disturbance of some force occurs, such as a shock, a fright, or an illness, the mental state is developed which precipitates his stuttering symptom. In other words, during the period of momentary paroxysm some chance occurrence of hesitating speech or predisposition determines the development.

Since the condition is endogenic, all having a heavy hereditary predisposition, the patient carries his burden all through life, though his symptoms can be kept in abeyance. As a whole, these patients are peculiar, very emotional, impressionable, self-analyzing, extremely sensitive. They are eccentric, dreamers with romantic tendencies, are subject to attacks of great anxiety to morbid fears and obscessions. Introversion occupies an important

place in the stutterers make-up. There is inability to focus the attention and maintain sustained effort at any work, and an equal inability to practice either mental or physical composure. He is often a "Tiquerur," and almost all demonstrate a marked condition of muscular incoordination.

When these patients come under the influence of some special emotion it is the immediate means of throwing them into a state of disharmony or incoordination which extends to the speech mechanism. Attempts at speech in that state result in spasmodic hesitations designated as stuttering speech.

Another prevalent condition that many of our patients suffer from—a disorder characterized by defective enunciation, that is, the inability to form correctly or utter, any or all of the sounds of speech. These patients are classified as Stammerers and Lispers, and must not be confused with stutterers, as stutterers show hesitating speech, while stammerers and lispers show mutilated speech. These patients either present a central (cerebral) involvement, or a peripheral involvement, due to malformations of the organs of speech. The central involvement is either of a primary, so called functional nature, or secondary, which is of an acquired nature. The peripheral involvement is either congenital (hare lip, cleft palate, malformations of the tongue, jaw conditions, etc.), or it is acquired, (conditions of lips, teeth, gums, palate, tongue, pharynx, larynx, ears, etc.).

Therefore in all conditions of defective enunciation there is present an anatomical defect which is found either in the brain proper or in the organs of articulation, that is, the organs of speech or in the various connections between these two parts. In most of the cases of the peripheral class, congenital defects due to arrested development are the cause. It is in but a very small percentage of the cases that the defect is an acquired one. These congenital defects according to the law of embryological development, are always to be found at certain definite points at the nose and throat.

In order to obtain a clear conception of the condition it is absolutely essential to have some knowledge concerning the embryological development of the parts involved, also the medical and surgical principle at issue; consequently, one readily sees why these cases when treated, should be under the supervision of medical men. To continue—besides the peripheral involvement spoken of, there is the central involvement. In most cases of the central class the condition depends fundamentally upon an in-

volvement of the structure of the brain, therefore the cause of the defect cannot be so easily detected.

It is a well known clinical fact that injuries to the brain, when the motor areas are involved, may result in spasms, paralysis, convulsions, etc. Likewise when a sensory area alone is affected, there result the various disturbances common to sensory nerves, numbness, parasthesia, and so forth; or when particular centers are involved, the various forms of aphasia may result. Concomitant with these resultant conditions, or existing independently, these cases result from cranial injuries received in childhood; for instance, a fracture of the bones of the skull, or a concealed hemorrhage beneath them, causing destruction or disintegration of brain tissue (either centers or tract fibers between them) with resultant degeneration of the nervous element.

Patients having a primary central involvement demonstrate an organic condition in the cerebral tissue in various stages of development. In some instances this condition partakes of the nature of a manifest anatomical structural disintegration of the cells or fibers which go to make up the various speech centers, or their proper association tracts. In other instances this functional disturbance being sometimes immediately apparent at the first efforts directed in speech and sometimes of a more latent and potential character.

In other words, the fundamental cause is not a destruction of one or more of the speech centers, but a general enfeeblement or weakness of the cerebral cells found within the centers, thus betraying itself in a special way through the delicate function of speech. Consequently, we can often expect to meet with solitary disablement of one of the speech centers and functional integrity of the others: for example, the motor speech and auditory speech centers, although very closely related to each other in function, may be enfeebled or disabled together or separately, presenting to us the symptoms referable to failure in reception and interpretation of speech, more frequently than the symptoms referable to the failure in production.

In this enfeeblement of function the images resulting from external stimuli, such as hearing or seeing, are unable to continue in response to such stimuli and as a result there ensues a substitution, a distortion, or even an entire loss of the efforts following the reception of the images. In order to make these facts more vivid it is important to understand the formation of images, perceptions, etc., and also the development of association between

them. This refers especially to the so-called centers of the brain. The symptoms of these patients are usually very pronounced and are readily appreciated when classified according to definite forms, the terminology of the forms depending on the parts involved.

Besides the conditions just elaborated there are numberless others—I shall touch on just a few of them. It is surprising how many people apply for treatment who suffer from agitophasia, or speech agitans, a condition of excessive rapidity of speech, in which sounds or syllables are unconsciously omitted, slurred, mutilated, or in any way imperfectly uttered, causing at the same time the speech accent to become distorted. These patients have great difficulty in making people understand what they say, so much so, that they have a hard time in holding positions. A pathological condition of the nervous system is usually present. Agitophasia may be associated with stuttering or Agitographia, (a form of writing in which letters, parts of letters or words are mutilated or omitted).

Another form of mutilated speech particularly observed in young children is idioglossia. These patients seem to speak a distinct language of their own. Parts of words or whole words may be slurred, disjointed, or otherwise mutilated. In severe cases they are quite unintelligible except perhaps to their little brothers and sisters who often are the only ones who understand them. This condition of idioglossia is not associated with weakness of intellect, although there is often a family history of insanity. It is probably due to congenital deficient appreciation of musical tone. It is not associated with any malformation of the organs of speech.

We have had many children who suffer from auditory dumbness. The dumbness of hearing children, when young, is a condition of retarded speech development which is due to general physical weakness. These children have good speech understanding and under careful supervision and treatment can acquire normal speech.

Besides these cases of hearing dumbness we have of course had many cases of deaf mutism. These patients being of a special class, their speech training is of a special nature and it is not necessary for me to elaborate as everyone knows of the progressive work that is now carried on for the deaf. I wish, however, to mention that since the war we frequently have seen a number of cases of hysterical mutism in which the patient is absolutely dumb. I understand it was a common variety of war hysteria. Sometimes

it was combined with hysterical deafness, thereby producing hysterical deaf mutism. These patients could express themselves quite fluently both by writing and through gestures.

Cleft palate patients always prove interesting problems. In these cases, strange as it may seem, the speech or voice defect does not coincide with the size of the palatal defect; for there are small defects which greatly interfere with the production of speech, while in some large defects of the palate, even with hare-lip, one finds tolerable good speech without even resorting to the use of mechanical interference. It is hardly necessary to state that closure of the cleft does not remedy their defective articulation; but I might add that the resonance of the voice becomes more normal, simply through the improved anatomical status. In nearly every case speech training is not only advisable but absolutely necessary, for as well as there existed a faulty physical condition, there also existed a faulty psychical condition, and while operative measures have been successful, the speech remains the same.

Following the operation the cleft palate patient presents one or all of the following defects of speech: On account of the lack of elasticity and mobility of the soft palate the nasal snort is heard during the production of many of the consonants. There is a non-existence of the consonants K and G. Also a non-existence of the consonants L, T, D. Where there is a hare-lip there is a difficulty in the production of the labials.

Following an operation it occasionally happens that the soft palate is too short to reach close to the posterior pharyngeal wall, consequently some cleft palate patients possess to a more or less degree, a permanent rhinolalia-aperta voice, a nasal voice, even after everything possible has been done by both operative and speech training measures. The difficulties of the speech of these patients are nearly always increased by abnormal positions of the teeth and of the alveolar processes with the body of the bones to which they are attached. Their correction must be taken care of, before the best results in speech can be attained.

On account of our non-operative cleft palate cases and the numerous conditions of dental anomalies that are present in all kinds of defective speech cases we have found it necessary, in order to get the desired results, to conduct a fully equipped dental department, where special obturators, plates and MacKenty splints are made, and orthodontia work is carried out for malocclusion cases.

Speaking about voice and speech results in these cleft palate cases, I wish to call to your attention a special phase which these patients present, the condition, amusia. All cleft palate cases suffer from amusia, that is a disturbance in the musical faculty. They all demonstrate one definite form of amusia, that of tone deafness. Defects in the musical and speech faculties may coexist or exist independently of each other. The independent occurence of disturbances in their musical faculty points to the existence of a separate center presiding over the musical memory.

No progress can be made in the elimination of nasality, the great bane of cleft palate cases, until the patients' musical sense has been developed to such a degree that he or she realizes the difference between nasal and non-nasal intonation. As soon as this takes place the patient strives for purer intonation, and gradually the nasality diminishes until it is to all intents and purposes completely lost. In other words, he has lost his tone deafness and of course does not suffer from amusia any longer.

It may be in place right here to say something about nasality in general. As you all know, nasality is a disorder due to disturbances in the vocal vibrations which pass from the oral to the nasal cavity, producing nasal out of non-nasal sounds, the nose being closed when it should be open, or vice versa, being open when it should be closed. Nasality may be due to congenital conditions as cleft palate cases, or it may be due to injuries following the removal of tonsils and adenoids, to inflammations (nose, pharynx, etc.), tonsilitis, diphtheria, syphilis, tuberculosis, etc., to tumors, to nervous conditions, bulbar paralysis, ties, etc. Nasality causes the voice to become weak, flat or dull, non-melodious in quality, approaching twang characteristics. It causes a change in speech, making articulation difficult. One can readily realize the discomfort and embarrassment a patient endures from a defect of this kind.

In speaking of discomfort and embarrassment it seems to me that there is nothing more distressing or embarrassing than a shrill high pitched woman's voice, a falsetto voice, in an adult male. I would like to say a word about the prevailing erroneous impression in regard to this falsetto voice in the male. A falsetto voice is a voice often reckoned to the head register, its volume and area being almost as large as the chest register, reaching from about D^1 to F^2. It is an octave above the chest register. It is of a thin, shrill quality, sounding forced or unnatural, and as its name implies, is a false voice. In brief, it is a child's voice pro-

duced by an adult, originating at that period of life when physically the boy or girl is man or woman in everything but voice. This voice suggests a lack of muscular control, besides a disturbed balance in the respiratory tract.

Of the vocal anomalies that occur during or following mutation, the persistent falsetto voice is the one most frequently observed. While the condition occurs in both males and females, most of the cases that come under observation are in males. The falsetto voice is characteristic of the voice of the eunuch or the eunuchoid. While their voices are practically similar in reference to pitch, ranging between tenor and soprano, they are absolutely dissimilar in reference to origin.

Eunuchs are those individuals who for some reason have had their sexual glands removed (castration) in early life, a complicating result of which is non-development of the larynx, so that the voice remains high. Eunuchoids are individuals who without being castrated entirely simulate in clinical manifestations the true eunuch type. This condition is due to developmental disturbance beginning primarily in the sexual glands. One of the symptoms is a change in the pitch of the voice which becomes high.

On account of this similarity, the term, eunuchoid voice, has been used synonymously with falsetto voice. The use of this term has given rise to much misunderstanding which of course is rather unfortunate for those having a falsetto voice, for the falsetto voice of an adult male who is not a eunuch or a eunuchoid, does not depend on imperfect genital development, but in practically all cases, is the result of a faulty habit which is contracted by the subject at the time of the change of voice and retained in after life.

While on this subject of voice defects, I might add that we have had a great number of patients suffering from organic and functional manifestations in the respiratory tract. Their voice abnormalities were the result of various conditions, as hyperplastic rhinitis, nasal obstruction, adenoids, tonsilitis, hypertrophied tonsils, follicular pharyngitis. Of the laryngeal disturbances, we frequently observed conditions of hysterical mutism, laryngeal phobias, aphonia, hypophonia, phonesthenia laryngeal spasms, paralysis. From all appearances the frequency of these conditions can be readily explained by the multiplicity of functions which require the use of good voice, as in the case of clergymen, lawyers, actors, orators, teachers and salesmen.

Laryngeal or pharyngeal trouble of professional voice users becomes a serious problem on account of their livelihood depending upon their voices. Under these circumstances neuropathic tendencies develop very readily; for example, let any slight laryngeal trouble which may happen to last for a few days, disturb the patient, fixation may be produced. Not alone do these voice patients develop neurotic tendencies but from my observations I have found that all of our patients whether they suffer from a voice or speech disorder of a peripheral or central nature, all have neurotic tendencies.

Speech is the great vehicle of human intercourse. Business and social life depend on it. To put it bluntly, if you can talk you can put your ideas over. You can win success. You become independent. If you cannot talk, if your lips and tongue refuse their service, you cannot put your ideas over. You are dependent, and on account of continued conflict with everyday life, which to the normal speaking person is no conflict at all, you belong to a class apart, and you naturally develop neurotic tendencies.

To my mind, of the various kinds of defects that both children and adults are prone to, there is none so depressing or far reaching as a speech abnormality.

The world has been treating these people mostly as a joke. I am sure that anyone here can easily recall any number of funny stories they have heard, especially about stutterers. From my observations and personal contact with them at the clinic, I know that defective speech is nothing short of a tragedy; for these people are unadjusted to their speech environment; they can never muster up courage or power to get anywhere, speech or otherwise; and they need much consideration, besides the many forms of treatment.

Psychology is one of the master keys of all sorts and conditions of problems. To attempt to cure our patients, especially those who stutter, without analyzing their psychology, is absolutely useless and a waste of time. After the patient has attended the clinic and has become acclimated to the conditions found, the results of his analysis are amazing. They all possess undiscovered gifts. Life's conflicts, especially to these sufferers, are so tremendous and severe, that these gifts are starved out. Though the soil is fertile and the seed fell there, unfortunately appalling surroundings and personal conditions did not allow it to develop.

We have definitely noticed that besides the psychic factor, there is always a physical factor present. It is hard to conceive

how pathologic reaction could occur in anatomically and physiologically sound bodies. The rational common sense plan was to search for factors that bring about physical failure in each life, and to do everything possible to eliminate them.

The tendency to weaken, to fall away from standards, lies in all of us, and especially in our patients. Something must be set up against this tendency of the individual. Education and re-education is the factor which overcomes the faulty voice or speech habits of our patients. Good articulation or good speech is largely, if not entirely a matter of subconscious action. The more closely it approaches the automatic stage, the more perfect it becomes. After the fundamental movements of the vocal organs are firmly established, according to a definite standard, the mind gradually frees itself from the consideration of details, and the speech becomes subconscious and automatic. It is then normal speech, distinct, clear and correct.

Investigations showed that social life was practically an unknown quantity to our patients. They complained that if they could only meet people and talk and asssociate with them the way other folks do they would be forever happy and could better bear their cross of affliction. It's the same old story over again—our association with our fellow men is the big thing in life after all. An infusion of the spirit of sympathy and optimism, of good fellowship and helpfulness, of praise and encouragement, is prolific in results. We have found that the social service phase of the work as carried out by us at the clinic is of the utmost importance and one of the principal factors, strange as it may sound, in the cure of our patients.

Therefore, a composite therapy of a psychological, medical, re-educational and social nature, is absolutely essential for the cure of those suffering from defective speech. The doctor, the educator, and the social worker are the greatest factors for good, when they are fused together in such a harmonious union that their adjustment completely saturates the maladjustment of these long suffering patients. In order to carry out such a cooperative work, a departure in clinics was necessary, and that prompted the founding of our institution.

While our clinic is at present small and overcrowded, and not as large and well equipped as we expect it to be in the near future, still without doubt it stands alone as being the first public general hospital devoted solely to the cure of defective voice and

speech disorders. We are proud that we have succeeded in establishing such an institution in a great city like New York.

DISCUSSION.

Dr. Frederick Martin, New York, said that he could not appeal to them more strongly than Dr. Greene had done by his work. In New York there were 30,000 speech defect cases. There were nine evening classes, and the clinics for handling these cases were gaining interest. It had been left to the educational authorities entirely, but medical men should lend their support. Speech defects from disturbance of the air tract were very important. Professor Miller spoke of the various methods of producing sound waves. There were many cases of abnormal speech due to interference with the cartilages and bones of the larynx and pharynx, especially the posterior pillars of the fauces. This gave a hoarse dyspnoeic voice. By strengthening the soft palate one would get improvement in the voice. In regard to stammerers, the speaker said he had been one and he knew what it was to suffer from this defect. Some were driven to suicide by it. Doctors must take more interest in the subject. Cases were often referred by the family physician, who had tried to cure them and failed. Often re-education of the central nervous system was necessary, with cooperation of the visual and auditory centers. By development of the kinesthetic sense, better coordination of the other senses was brought about. The centers become atrophied from disuse, and if one demanded speech and better vocal action, the centers would come to life.

The Secretary then introduced Miss Lilian Kiel, a teacher of cleft palate speech work. Miss Kiel herself had a complete defect of the hard palate, closed very skillfully by a contrivance which she herself had helped to design and construct. Miss Kiel had acquired perfect phonation and speech although she had no appliance until 18 years of age and was not able to make herself understood. She said she had been considered feeble minded.

Mr. Albert Bigelow Paine (the Biographer of Mark Twain) spoke (by invitation) on the subject of speech defect. He said that medical names and performances were most impressive to him because he did not know what they meant. When he read of a successful excavation in a man's liver, or plumbing in his wind pipe, he wanted to know how the victim felt before, and after this performance,—in short, how the other side felt. He was there today to represent the "other side." He was one who had wonders performed on him. He was a stutterer for 50 years. His father, now 97 years of age, stuttered before him, and the impediment might yet shorten his life. Mr. Paine said, like all stammerers he had been acutely sensitive to ridicule and dreaded to be asked questions as he knew he could not answer. He often said things that were not true, because they were easier to say. In fact he was like the man who came home after a festive evening, and his wife asked him why, when he had had enough he did not say Sarsaparilla, and the man replied that when he had had enough he could not say sarsaparilla. He never could say what he ought to say, and so he took up writing because he could not talk. After associating with writers, he became acquainted with Mark Twain, and after that they were almost constantly together. Mr. Paine quoted several of Mark Twain's quaint and deliberate sayings. He said he greatly regretted that the author had not lived to hear him talk like anyone else. The way he had heard of Dr. Greene's clinic was through a friend with whom he was dining. He was sceptical at first, but after the first evening when he met 150 of his fellow sufferers (the free patients whom Dr. Greene helped) he found that he was getting confidence. He spent some time in town studying the method and then returned to

his family in the country. He had said nothing to them, as he feared disappointment if it did not succeed. The first evening nothing was said, but he saw them look at each other and the next morning he asked his wife if she had noticed anything unusual about him. When he told her he was cured it was the most dramatic moment of his life. He had felt since that a new life had come instead of the old restricted one and he had done all he could to get contributions and to make known the work of the 34th St. hospital. He hoped that there would be many others like it throughout the land for those afflicted as he had been.

Dr. Greene presented one of his cured pupils, who recited a poem of Kipling's with considerable dramatic effect.

LATERAL SINUS INFECTION; DIAGNOSIS, TREATMENT AND COMPLICATIONS.*

By G. L. TOBEY, JR., M. D., Boston, Mass.

Through constant repetition in medical literature and as a hospital colloquialism, the terms "Sinus Thrombosis" and "Sinus Phlebitis" have come into general use as a definite pre-operative clinical diagnosis. One, or both, of these terms is a misnomer in a large number of cases; it is not unusual, in a so-called typical case, to open a lateral sinus in which there is no evidence of thrombosis or demonstrable phlebitis, and have complete recession of symptoms follow. I feel that the term "Sinus Infection" should be used in the clinical reports of cases showing the accepted symptomatology unless demonstrable phlebitis or thrombus has been shown to be present. These misnomers have undoubtedly led to much of the apparent confusion among otologists as is frequently demonstrated in discussions.

The terms "typical" and "atypical," when used as descriptive of clinical cases, are not only misleading but are most decidedly misnomers. There is no "typical" or "text-book" train of symptoms in the early cases—the generally accepted typical symptomatology is present only when septic thrombosis has taken place and the patient has a general septicemia. Since there is no typical symptomatology, the corollary must be equally true, and we are, therefore, unjustified in reporting cases as "atypical." Cases of obscure or difficult diagnosis should be reported "yes."

A correct diagnosis of the condition present can be arrived at only by very careful and painstaking clinical and laboratory observations; the consulting otologist is many times, however, obliged to depend on clinical evidence and his experience when in consultation where laboratory facilities are lacking, and also on his operative findings.

A history of existing or pre-existing middle ear suppuration is the rule, although the otitis media may have been so slight as to cause no perforation of the drum membrane, the middle ear returning to normal within a few days, and yet may give rise to a supervening sinus infection with or without demonstrable mas-

*Candidate's Thesis Recommended for Publication by the Council.

toiditis. This is not a rare occurrence and does, I think, account for many of the cases of so-called "primary mastoiditis" and "primary sinus thrombosis."

For purposes of mental classification we may divide the cases into three groups: the one which may be termed the *septic explosive* type, in which cases the symptoms are most violent from the very onset and the patient is evidently suffering from a very acute infection; second, what may be termed the *typhoidal type*, in which cases there is an apparently low-grade infection and the differential diagnosis is relatively difficult, and arrived at only by very careful exclusion; and third, the *latent* type, having intermittent mild symptoms of septic absorption for weeks or months following a mild acute suppurative otitis media of short duration and suddenly "blowing up" with a virulent meningitis. This latter type is not uncommon and is practically always fatal.

In the general consideration of the symptomatology there are four distinct types of temperature charts:

Type A. The accepted picture of acute sepsis with very sudden elevation of several degrees and equally sudden remissions to normal, or even sub-normal. This may occur several times within a few hours, or but once or twice during the twenty-four. The temperature should be taken every two hours in suspected cases, since the rise and fall takes place in a very short space of time, and is often lost on a four-hour chart. There may be one or two excursions of temperature followed by twenty-four, forty-eight, or even seventy-two hours of normal temperature, with a repetition of excursions.

Type B—The temperature showing a persistent irregularity of one to two degrees above normal to slightly below, during the twenty-four hours.

Type C—An elevation of two to three degrees, which does not remit to normal but shows slight remissions and elevations from 100° as a basis. This may persist for several days and then return to normal. This type nearly always recurs after remaining at normal for a few days.

Type D—It is not an uncommon experience to find a definite sinus thrombosis, and occasionally a broken-down sinus wall and fistula, in doing the mastoid operation, the temperature chart at no time having shown any temperature whatsoever. In a series of seventy-three cases this occurred eleven times and in three cases the sinus wall was completely necrosed.

The pulse usually follows the temperature and has been found of little diagnostic value.

This great variation demonstrates clearly that the temperature cannot be considered a definite diagnostic symptom. Its presence indicates infection, but its absence or its atypical characteristics do not preclude an infection of the sinus.

The temperature chart must, however, always be taken into consideration in forming the conclusions as to diagnosis.

Great stress has been laid on the presence of chills. True rigor occurs in less than 50% of the cases. A large majority will complain of fleeting chilly sensations, accompanied by sweating. This is not, as a rule, volunteered by the patient, but is brought out by inquiry. A common occurrence when making a visit is to find the patient's nightclothes moist, or even saturated, and on inquiry the patient says that he has occasional "hot flashes." The latter manifestation is often overlooked, yet is most suggestive of infection.

Subjective head symptoms are usually present and may be described as of three general types:

(a) Sensation of indescribable pressure and heaviness, usually localized to affected side, and inclination to rest that side of head on hand or pillow.

(b) Intermittent darting pains (without the intensity of a tic) radiating toward the temple and upward toward the median line, seldom toward the occiput.

(c) Restlessness at night, with inability to sleep owing to a dull, grinding, indescribable headache—patient is seldom able to give a lucid description or definitely to localize the pain. This type must always be taken into consideration as it is a most frequent forerunner of sinus infection, and more especially of basilar meningitis.

The toxemia has a peculiar characteristic in that there are intermittent periods of exhilaration and feeling of well-being, followed by periods of depression.

Optic neuritis or choked disc may be present in a small percentage of cases (10% to 11%) due to meningeal irritation and infection, or from extension of the thrombus and consequent blocking of the petrosals, or even involvement of the cavernous sinus.

A more common nerve lesion is paresis of the sixth. This is toxic in origin and not infrequently found in acute suppurative otitis media.

A serous meningitis with a positive Noguchi and Ross-Jones has been observed in several cases.

In a series of over one hundred cases the average leucocytosis was 15,000, with a polymorphonuclear percentage of seventy-eight. The leucocytosis is of value only when taken into consideration with the other symptoms present, and when taken in series.

Blood Culture. Too much emphasis has been placed on the value of the blood culture as a diagnostic sign of the presence or absence of sinus infection. It is regrettable that so much emphasis has been placed on this point, since a review of recent literature repeatedly reveals cases of unnecessary delay and undoubted avoidable deaths. When a bacteremia is present it is an indication of infection and, when taken into consideration with the other symptoms present, is an aid in the diagnosis, but it must be borne in mind that it may be positive in practically every acute infection—as pneumonia, tonsillitis, acute endocarditis, erysipelas, etc. A negative culture does not preclude the presence of infection since it may be negative today, positive tomorrow, and again negative on the following day. The author has repeatedly observed cases, with demonstrable septic sinus thrombosis, which at no time showed a positive blood culture.

Edema or infiltration, with tenderness on deep pressure over the area drained by the mastoid emissary vein, was the most constant objective symptom which was found present in a large series of cases, and was present in practically every case of mural or complete thrombosis of the sigmoid sinus. This sign or symptom is quite distinct and readily differentiated from mastoid edema and tenderness, and, per se, never extends forward over the posterior border of the mastoid.

The same symptom or sign is found just below and posterior to the mastoid tip due to blocking or infection of the posterior condylar vein which enters the sinus, as a rule, just before it forms the jugular bulb. (This vein is not constant.)

Sufficient emphasis has not been placed on this symptom in the past.

Enlargement of the external jugular on the same side is not infrequently observed. As to the value of this observation I am unprepared to state, yet it may be borne in mind in a case of double mastoiditis having other symptoms of infectious thrombosis.

Tenderness along the course of the jugular is frequently present, practically always due to infection of the cervical glands from the

original otitis media and mastoiditis, and is of no practical value in diagnosis of sinus infection. In not one of over three hundred cases of sinus infection in a large aural institution has this sign been demonstrated to be of value.

Since a large extra-dural or perisinus abscess will, in a certain number of cases, simulate symptomatically a lateral sinus infection, the mastoid operation should be performed, and in every case the sinus should be exposed before ligating the jugular. Undoubtedly there is concomitant direct infection of the endothelial lining of the sinus with, mayhap, a slight parietal thrombus formation. Having found, however, that the majority of such cases receive immediate and permanent relief by drainage of the extra-dural abscess, it is my practice not to interfere with the sinus nor ligate, in the absence of a demonstrable necrosis of the sinus wall, or very marked evidences of septicemic or pyemic symptoms. Should subsequent developments demand, the sinus operation may be performed.

Anatomically, the type of mastoid apparently plays no important role. Sinus infection found in cases showing few, if any, well-developed mastoid cells, with the lateral sinus infringing on the antrum and posterior canal wall, suggests this as an etiological factor; yet, in the large number of this type of mastoid encountered, the percentage of sinus infection is no greater than in the broad, deep, well-developed mastoid process.

Prognosis. It is impossible to make a definite statement as to the prognosis of this condition since death is due, in all cases, to an intercurring or supervening complication, and not from infection of the lateral sinus per se. In considering the prognosis each case must be taken as a unit.

A review of the causes of death in twelve cases shows two from cavernous sinus thrombosis, six cases of septic meningitis, three cases of temporosphenoidal abscess, one case of cerebellar abscess.

The prognosis, as influenced by ligation or resection, is equally hard to determine. We do know, however, that practically 90% of the cases of simple ligation recover, but, on the other hand, there are a very large number of unrecognized or recognized but not operated on cases which recover after a longer or shorter course, with or without pyemia.

Operative Treatment. If, owing to the previous subjective and objective symptoms, or if the conditions found at the mastoid operation indicate the possibility or probability of sinus infection, the lateral sinus should be exposed. The bony wall covering the

sinus should be removed by means of a chisel, sharp spoon curette or rongeur. No definite steps of technique can be laid down since the contour and the conditions present differ in each case, and the technique of the individual operators varies.

As a general principle, however, in the cases where the sinus is not exposed by disease, the knee of the sinus seems to be the point of election for the original exposure. I have found the use of a sharp gouge or the spoon curette to be the safest. In this way the bony covering may be taken off gradually without the danger of perforation of the sinus wall, and by this means no sharp spicules of bone are driven into the wall of the sinus.

A small exposure having been made, it is readily enlarged, either by the introduction of a curette between the sinus wall and bone (the sharp spoon of the curette being outward), or by the introduction of a small, right angle rongeur.

In the use of the rongeur care must be taken that the wall of the sinus is not nipped between the lip of the instrument and the bony wall. This is not an uncommon accident.

The bone should be removed over the sinus downward and forward to the jugular bulb, and backward from the knee toward the torcular.

We have made it a rule, where there is a question of sinus infection, to expose the emissary vein when feasible, and to remove the bony wall of the lateral sinus beyond the edge of the sinus on each side. Injury of the sinus is most common in removing the bone just beyond the knee where the sinus wall is usually in very close contact with the cortex, and, at the lower end of the sigmoid portion, just above the jugular bulb. At this point one is working at a difficult angle.

In cases where disease has destroyed a portion of the sinus wall the remaining bone should be carefully removed by means of the curette and rongeur, and the sinus wall exposed backward for at least one-quarter to one-half an inch beyond the evident involvement, and the bone should be removed below as far as possible toward the jugular bulb.

The sinus wall itself should now be very carefully investigated. The presence or absence of a necrotic area in the sinus wall should be determined. In the absence of a definite fistula through the wall it is absolutely impossible to make a definite statement as to the presence or absence, or type of infection or pathological change which may have taken place within the sinus itself.

We have discarded the use of the test puncture since it is most unreliable; and there is the added danger that the needle may, in the presence of a partially collapsed sinus, be passed through the dura, with a resultant infection.

We have many times demonstrated the presence of mural thrombi by making a small incision in the sinus wall, using a very sharp knife, very slowly cutting through the wall of the vessel and, on incising the endothelial layer, have demonstrated the presence of blood clot.

The thrombosis of the vessel has also been demonstrated by opening the emissary vein, having first passed a ligature around this vein proximal to the point of opening, then inserting a small sterile silver probe into the lumen of the sinus. The use of this probe is necessary since the valve-like opening of the emissary vein into the sigmoid sinus often prevents the flow of blood from the sinus into the vein.

The most satisfactory and conclusive method is that of free incision of the sinus wall. Pressure is applied between the cortex and the sinus wall toward the jugular bulb, and at the upper limit of the sinus exposure. An incision is then made through the wall, care being taken that the inner wall of the sinus is not injured. The lumen of the vessel is then readily explored. The sinus wall having been incised, the lower plug may then be loosened to demonstrate the presence or absence of obstruction in the bulb. The same procedure is carried out at the upper end of the incision to demonstrate the presence or absence of obstruction.

A positive diagnosis of involvement of the sinus being present, we should immediately proceed to cut off the direct communication of the sinus with the general blood stream. It seems to be a most mooted question as to just what procedure should be undertaken under these conditions. On the one side there is the relatively conservative, simple ligation of the jugular vein; on the other, the more radical excision. Statistics bear me out in saying that the simple ligation is the logical operation, bearing in mind that it is necessary in a small percentage of the cases to proceed with complete excision of the vein.

In over 200 cases, in a large institution, it has been found necessary, owing to extension of the infection in the jugular below the facial vein, to resect in only two cases.

In favor of simple ligation we have first, the relatively few cases cases requiring complete resection; second, the very short time required for the operation, (ten to fifteen minutes) with the con-

sequent small amount of shock to the patient, non-exposure of the tissues of the neck to infection, the very small, insignificant scar; and finally, the ultimate results as shown by statistics.

The disadvantages of resection, on the other hand, lie, first, in a much more extensive operation, requiring in average hands a long period of time with the consequent added shock to an already very sick patient; second, the opening up of a tremendous area to infection; third, the resultant, in many cases, unsightly scar, (and I do think that the esthetic should be taken into consideration when possible and safe); fourth, statistics and careful observation over a very large series of cases has shown that this extensive operation is unnecessary except in a very small percentage of cases. I am not making the statement that resection of the jugular vein is not necessary, but I do say that it should not be done unless it can be definitely demonstrated that septic thrombosis has extended below the point of election in ligating.

Technique of Ligation of the Jugular Vein. The point of election for ligation is the superior carotid triangle, and at about the level of the thyroid cartilage, above the junction of the facial vein; this allows the facial vein an opportunity to aid in establishing the collateral circulation.

My procedure in recent cases has been to tie high, first outlining the natural transverse folds of the skin below the jaw, with the chin in the median line, and then making a small incision one to one and one-half inches in the long axis of one of the deepest depressions. The head is then turned to the opposite side and a small sandbag placed under the shoulders, thus giving a slight extension of the neck. Incision is then carried through the platysma muscle, a curved Mayo scissor is then inserted just in front of the sterno-cleidomastoid muscle, and by means of dry dissection the carotid sheath is readily brought into view. The deep dissection is carried on until the facial vein is demonstrated. A double number one chromized gut ligature is then passed around the vein just above the facial. These two ligatures are then separated for about one-half an inch, and by the use of traction the lumen of the vessel between the ligatures may be alternately opened and closed, and the patency or obstruction readily made out.

When the vessel is evidently patent, the proximal ligature is first tied, (that is the one nearer the jugular bulb). The distal ligature, the blood having been expressed from between, is next tied. The ligatures being cut, the vessel is dropped back into place,

one or two interrupted catgut sutures are taken in the superficial fascia, the skin is then closed with two or three horsehair sutures, and a collodion dressing is applied.

Many operators advocate cutting the vessel between the ligatures. There is no advantage in this procedure, and it opens an avenue for direct infection of the deep tissues of the neck, especially in the presence of a positive bacteremia, or in the presence of a slight infection of the endothelial lining of the vein. Certainly nothing is gained by this procedure, and it should be discarded as unnecessary and dangerous.

Should the jugular vein be found to be unquestionably thrombosed and infected, as occasionally occurs, the operator may simply extend his operation and do a complete resection. The jugular having been ligated or resected, we proceed with the lateral sinus operation.

The plug at the lower end of the sinus is removed, and in the presence of free hemorrhage, which demonstrates a patent inferior petrosal and condylar vein, this plug is immediately replaced, and nothing further done at this time. In the absence of free hemorrhage, however, the bony sinus wall must be removed downward and backward as far as possible, to give access to the jugular bulb. I find that sufficient exposure is obtained without the radical procedure of Grunert. A small curette (one with a malleable handle being preferred) is then used to remove the clot of broken-down thrombus from the bulb, in so far as possible. Very frequently during this procedure free hemorrhage from the petrosal results. Should no free hemorrhage be obtained, a small gauze wick, plain or iodoform, is passed into the cavity. The plug is then removed from the upper end of the sinus in the region of the knee. The membranous sinus wall and the bone over-lying should be entirely removed to a point beyond the presence of demonstrable thrombosis, the removal of the bone always preceding slightly the removal of the membranous portion of the sinus.

A procedure which may be used is that of trephining the cortex over the lateral sinus, from one to one and one-half inches posterior to the knee, and beyond the superior petrosal sinus, and shutting off the blood stream by pressure with a small roll or a plug of gauze placed between the cortex and the dura. By this means, free exploration of the sinus wall up to and in the presence of thrombosis of the superior petrosal and even beyond this vessel, is facilitated. By this means a thrombus is formed by a back pressure which has no direct communication

with the infected thrombus. Should, however, the infection be found to extend posteriorly to the point of exposure, another exposure may be made further back. In this way we have a control, not only of the tremendous hemorrhage incident to the primary removal of the thrombus, but we also have a control of hemorrhage at the first few subsequent dressings. This plug may be left in situ for five or six days. The opening is then readily closed and leaves practically no scar.

An iodoform or plain wick is then passed along the trough of the exposed sinus and a light gauze packing is placed in the mastoid cavity. This dressing is changed if no untoward symptoms intervene at the end of four or five days. The wick is removed from the jugular bulb region, if clean, another wick is inserted. Should there be a slight amount of pus, this is readily removed by means of irrigation. The wick is also changed at the upper end of the sinus at this time. The pressure is relieved from the accessory plug and, if no hemorrhage occurs, this is permanently removed at this time; otherwise it is left in situ until the next dressing, two days later.

Should there be a continuation or recrudescence of the septic symptoms, we must consider first the question of metastasis before ligation; second, secondary infection of the neck at the point of ligation or resection; third, infection in and just below the jugular bulb; fourth, extension of septic thrombosis toward the torcular; fifth, intercurrent acute infections; sixth, iodoform poisoning, if iodoform was employed in the dressing.

Physical signs of a small metastasis which has occurred before or immediately after ligation may be delayed for several days. The first symptoms being those of sepsis, with a beginning localized tenderness at some distant point. The common location is in the body of the long muscles, especially in the calf of the leg. When it occurs in one or more of the joints, a careful differentiation with acute arthritis must be made, since we may have an intercurrent true arthritic infection. Metastases in the lung are fortunately rare, but must always be considered under these conditions. Secondary, deep infection of the neck, following ligation where wound was closed, occasionally occurs. I have seen several cases where no objective evidence indicating a neck infection could be found for two or three days after the septic temperature had occurred or recurred; free drainage immediately relieved the temperature.

The statement has often been made in meetings, and I have also found it in print, that in simple ligation without removal of the jugular bulb and vein we are leaving a large sack of pus which does not have free drainage, the reason given being that pus does not readily drain uphill. I think that the men making this statement have neglected to consider the fact that their patients during this stage of the disease are in a recumbent position, and that, as a matter of fact, the upper opening of the jugular bulb is the most dependent portion involved. Statistics most certainly do not bear out the contention that this is a dangerous procedure. I have, however, in a number of cases with a recurrence of septic symptoms, found the bulb and the vein immediately below filled with fluid pus, which was readily removed by means of douching with a very small, fine catheter inserted along the course of the vessel. Seldom has it been necessary to repeat this procedure more than two or three times.

Another complication of convalescence is an extension of the thrombus and infection along the venous channel toward the torcular. This condition is not, as a rule, accompanied by marked signs of sepsis, the typical picture being one of increased apathy on the part of the patient, complaint of dull, heavy headache on the affected side, with occasional increasing signs of intracranial venous congestion or pressure. I have twice found it necessary to open the sinus as far as, and even into the torcular itself. Fortunately the anatomical structure of the torcular, as a rule, precludes the probability of direct extension of the thrombus into the opposite sinus. In speaking of the metal hepitude and evidence of intracranial congestion as a complication, one must bear in mind the possibility of a poorly developed sinus on the opposite side or its absence altogether.

The most frequent complication simulating a symptomatology of sinus thrombosis is a localized central pneumonia. In children and in adults a small area of central pneumonia may be in existence for several days, giving rise to a typical septic temperature with chills, the physical signs not appearing for 72 or 96 hours.

Erysipelas must be taken into consideration, especially the type which gives evidence of sepsis for several days before local objective signs occur. We must also bear in mind the question of malaria, acute tonsillitis, acute arthritis, the focal infections, etc.

The frequent use of iodoform as a dressing has led to occasional cases of acute iodoform poisoning. The onset is very acute, usually ushered in with severe chill, and temperature of 102° to 104°,

profuse sweating, and running a definite septic temperature chart. The local manifestations, such as marked redness and swelling, which embrace the whole auricle and the region about the wound would lead one to suspect the source. This readily subsides on the thorough removal of the iodoform.

A very unusual and rare complication is the occurrence of a septic sinus thrombosis on the other side. I know of but one authentic case of this condition in which one jugular was tied, with complete opening of both lateral sinuses, and ultimate recovery.

DISCUSSION.

Dr. Edward B. Dench, New York, said that the paper showed careful study but he was sorry that Dr. Tobey spent time in hair-splitting about terms. Where there was specific infection of the lateral sinus there was inflammation of the vein as well, no matter what one called it. There was a place for the word "atypical," certain cases ran a definite course. The type designated "B" was atypical, where the diagnosis was made on one or two degrees of temperature. Personally Dr. Dench said he would not make a diagnosis of lateral sinus thrombosis on temperature indications alone. Slight gastro-intestinal disturbance might cause temperature. The Boston school might make a diagnosis on a two degree rise of temperature, but no man in New York could do it. That was why Boston men did ligation more frequently than in New York. Where there was a slight diurnal rise of temperature going on to spontaneous recovery, it meant that a slight amount of septic absorption had taken place in the wall of the lateral sinus, but that would be the same in any operation near the large blood vessels. In the type B case, without any temperature, one found obliteration of the sinus at operation. The speaker remembered one such case; he treated it by picking up the proximal and distal ends of the sinus and excising the veins. There were also remittent cases, indicating sinus thrombosis; these were not very rare. Dr. Dench had not seen many subjective symptoms, and he thought the comparatively good condition of the patient made one suspicious. In regard to blood cultures,—negative ones were not significant, because one might be positive one day and negative the next. In occlusion of the sinus the bacteria did not reach the circulation, but when the clot was removed, infection entered the blood stream. The bactericidal power of the blood was also a factor. Cultures near the sinus might be positive, and from the arm, negative. As to edema, it was not necessarily confined to the emissary vein. Glandular enlargement at the angle of the jaw was diagnostic. In regard to hemorrhage, it came more from the superior petrosal than the sinus.

Dr. George W. McKenzie, Philadelphia, said that many cases of sinus thrombosis no doubt recovered without being diagnosed. Those classes Dr. Tobey called B, C, and D, with early temperature, had no doubt a sterile thrombus. All thrombi begin as phlebitis. There were then toxic products from bacteria, seeping into the cavity, bacteria might never invade the thrombus. If the pathology was bad, the clinical side correlated.

Dr. George L. Tobey, Boston, closing said that other evidence had to corroborate the temperature chart, but a low temperature with other evidences of toxemia was indicative. He was not strong on the blood culture question, because too much emphasis had been placed on blood cultures, and this was misleading. The emissary vein spread over a large area, and edema over this region was considerable. In regard to ligation of the facial, he had never hesitated to tie it because he had never seen complications resulting therefrom. He had not entered into pathological questions, this was purely a clinical paper. No doubt 50 per cent. of cases recovered without interference with the sinus.

MEETING OF THE EASTERN SECTION, HELD IN NEW YORK CITY, FEBRUARY 26, 1921, UNDER THE CHAIRMANSHIP OF DR. HARMON SMITH, OF NEW YORK CITY.

ARE THERE CASES OF FOREIGN BODY IN THE LUNG IMPOSSIBLE OF BRONCHOSCOPIC REMOVAL?

By CHEVALIER JACKSON, M. D., Philadelphia, Pa.

Your chairman has requested me to prepare a paper on the limitations of the bronchoscopic removal of foreign bodies from the lungs. It is not impossible that I may have to appear before you on some future occasion and acknowledge my present opinion a mistaken one, but herein is presented to you the outlook today as I see it.

In view of the developments of bronchoscopy I have come to the conclusion that there are no fixed limitations to the peroral bronchoscopic removal of foreign bodies that have gone down into the lungs through the natural passages. Projectiles that have gone in through the chest wall may be too large to be brought up through the natural channels; but any localizable foreign body of appreciable size that has gone down these channels can, in my opinion, be brought back the same way; not the first time, perhaps; possibly not the third or the fourth time; but, if mortality be avoided, patient, concentrated endeavor will solve any problem of bronchoscopic foreign body removal. The only exception to this broad and sweeping assertion as to the unlimited possibilities of bronchoscopic foreign body extraction is in the case of foreign bodies that are so small as not to be localizable. It is obvious that a minute piece of pneumoconiotic material or a tiny fragment of peanut kernel, for instance, may get into a tiny branch bronchus and therefore cannot be located. It is impossible thoroughly to search the hundreds of minute bronchi and bronchioles of both lungs for tiny particles of foreign bodies that are nonopaque and hence not localizable. Nonopaque foreign bodies of appreciable size can usually be located by the ray and always by the physical signs.

In the case of a foreign body of appreciable size that may seem beyond the limits of bronchoscopy, one of four things will

happen sooner or later, if the patient survive. These four things are:

1. The mechanical problem of disentanglement will be worked out, or

2. A temporarily unreachable foreign body will be reached, or

3. The foreign body will shift to a location more favorable for removal, or

4. The foreign body will be loosened by suppuration, so as to be readily removable.

The limitations of anything mechanical are only temporary. When Morse invented the electric telegraph the limit of communication was a few miles. This limit was extended to thousands of miles. By developmental stages the limits were extended until they reached nearly the entire circumference of the earth, the limitations then being a continuous metallic conductor of sufficient area of cross section, and the necessity of sending only one message at a time. Then came the duplex with its two messages passing each other on the wire, doubling the capacity of the wire, to be followed quickly by the quadruplex with its fourfold transmission. Still the limitation of the continuous metallic conductor existed. With one great leap this limitation was swept away by Marconi in his development of means for dispensing with the continuous metallic conductor. Limitations still exist, but like the previous ones, they are not fixed limitations. These temporary limitations are being continuously set at wider and still wider radii. In the development of the telephone we have a parallel. Slowly and laboriously the telegraphic words were spelled letter by letter of the Morse alphabet, with the occasional relief of a sign for a few of the very common words. Such were the limitations when Alexander Graham Bell in the development of methods of teaching deaf mutes discovered that human speech could be transmitted by a mechanism using the induction of permanent magnets. Here the limitations were in hundreds of feet. Then quickly came the interweaving of the electric transmission with the feeble inductive mechanism of the permanent magnets, extending the limits of telephony to thousands of miles over metallic circuits. Then came wireless telephony. Who shall be so egotistical as even to say there are fixed limitations to any mechanical development, let alone to name such limitations.

Bronchoscopy being purely a mechanical procedure seems justly comparable in its development and in the elasticity of its limitations to telegraphy and telephony. The difference is of degree, not of kind. Bronchoscopy is, relatively, but a tiny field.

It might be said that bronchoscopy has one absolute limitation, namely, human life. But even this is but a temporary, not a fixed, limitation in that means for accomplishing the desired result without undue danger to life can be developed by patient, careful, concentrated endeavor, that is but a mite as compared to the concentration being applied to the electromechanical developments of today. Let us call mortality a barrier to be circumvented rather than a fixed limitation.

Perhaps the best illustration of my meaning will be afforded by comparing the early work of the Bronchoscopy Clinic with the work of today.

In publishing a report of five early failures I stated:

"They should be considered as failures of bronchoscopy and should be analyzed as such in order that bronchoscopy, like any other department of medical science, shall profit by its failures."

Since that time I have studied faithfully on the causes of those failures and I think it may be said that, while they were bronchoscopic failures in the then attained state of development, every one of the five foreign bodies would be easy of removal today. At the Bronchoscopic Clinic we have had a number of cases exactly parallelling each one of those five failures and in every instance the foreign body has been successfully removed, not always at the first bronchoscopy, but, by the there at obtained information, a solution of the problem encountered was worked out in the laboratory by the rubber tube method, supplemented when necessary by subsequent tests on the dog. A few of the parallel cases will be cited for illustration.

Unsuccessful cases paralleled later by successful cases. In 1914, before this Society, I reported as beyond the limits of bronchoscopy the case of a dental root-canal reamer in an ascending branch of the left upper-lobe bronchus. That it was beyond the limitations of the bronchoscopy of that day is shown by the fact that four of us had tried every one of the then-known methods of bronchoscopy. There was at that time no instrument devised that would reach around the corner into the stem of the upper-lobe bronchus, to say nothing of reaching an ascending branch of the upper-lobe bronchus of either the left or the right side. I believe my opinion was correct on the day it was expressed; but it is equally true that later developments have placed the upper-lobe bronchus, even the ascending branches of the left upper-lobe bronchus, well within the limits of bronchoscopy. We have had seven upper-lobe bronchus cases, two of which were in

ascending branches of the upper lobe bronchus. The following case is cited because it so closely parallels the previously reported case in which we failed.

Case No. Fbdy. 643. On March 16, 1918, a man, aged 22 years, was referred to the Bronchoscopic Clinic for the removal of a dental root-canal reamer which had slipped from the fingers of a dentist while at work on the patient's teeth, about two weeks before admission. The only immediate symptom was a paroxysm of coughing that subsided in a few minutes. On the 13th day slight cough was noted; temperature was normal; there was no pain or dyspnea. Bronchoscopy in a distant city was stated as twice unsuccessful "because of bronchorrhea." On admission to the Bronchoscopic Clinic a physical examination of the chest revealed the following:

Physical Signs. Expansion good, seems equal. Slight impairment of percussion note over the upper left. Expiration slightly prolonged over left apex. Vocal fremitus relatively decreased over the lower left. No rales or friction.

Dr. David R. Bowen made the following report of his ray study:

"Metallic foreign body (dental instrument) in the left upper lobe bronchus." (Fig. 1).

First Bronchoscopy. At the first bronchoscopy the upper-lobe-bronchus forceps were found of insufficient length and of not quite the proper curve to reach the foreign body in this particular individual. Measurements of the needed changes in the forceps were taken approximately with the eye.

Second Bronchoscopy. A specially made upper-lobe-bronchus forceps with a curve suited to the bronchial tree of the patient was passed through the bronchoscope into the left upper-lobe bronchus while Dr. David R. Bowen watched through the fluoroscope. The disappearance of the foreign body from the upper-lobe bronchus was noted by Dr. Bowen, but on withdrawal of the forceps the foreign body was not in their grasp. Dr. Bowen made a large number of plates and reported as follows:

Second Roentgenray Report:

"From the very careful plate study, including the entire respiratory and alimentary tract, there is no evidence of the foreign body, a dental brooch, seen in the previous examination."

The foreign body was not found in a careful search of the dark room which had by this time been cleaned out. Our conclusion was that the foreign body had been lost in the secretions, sponges, towels or sheets.

Comment. Here we had a case of the same kind of foreign body in the same position, in the same bronchus, in the same kind of patient (an adult male); we had the same circumstance of previous unsuccessful attempts, and we had about the same length of sojourn of the foreign body, as in the previously published case which I then thought was outside the limitations of bronchoscopy. The case demonstrates, I think, that the upper-lobe bronchus is now not beyond the limits of bronchoscopy and that the upper-lobe bronchus problem has been solved. This case seems to parallel

the failure of the earlier day as closely as is possible in clinical surgery.

Case No. Fbdy. 831. Female child, aged over two years. About a month prior to her admission the child while running with a box of needles held to her mouth aspirated one of them. A choking attack occurred at the time of the accident, but there were no subsequent symptoms. An unsuccessful bronchoscopy of 55 minutes duration was done under ether in a distant city. The bronchoscopist reported he could not find the needle. He did a second bronchoscopy four days later, using the fluoroscope in which he could see the needle though he could not grasp it. Severe dyspnea from subglottic edema followed this second bronchoscopy, probably because of the shortness of the interval between the two bronchoscopies. The edema subsided, however, without

Fig. 1. Dental instrument "around the corner" in an ascending branch of the left upper-lobe bronchus, dislodged by bronchoscopic, spiral, upper-lobe- bronchus forceps.

tracheotomy and the child arrived at the Bronchoscopic Clinic in good condition, without any symptoms except slight cough.

Physical Examination of the Chest. Expansion somewhat limited over the lower right lobe. Percussion moderately impaired over the upper right lobe. There is slight impairment also over the middle lobe. Over the lower right lobe posteriorly the percussion note is of greater dullness than is expected from the liver in that area. Breath sounds heard clearly throughout the chest. No apparent alteration in character except over the lower right lobe posteriorly, where there are snapping rales on deep inspiration.

Inferences: No obstruction to any bronchus. Pathology in the posterior portion of the lower right lobe.

Roentgenray Report by Dr. Willis F. Manges: "A sewing machine needle in the posterior branch of the lower lobe bronchus, point is upward and inward and forward. Fully one-half the needle is below the level of the dome of the right diaphragm. The lower end of the needle is within one-half to three-quarters inch of the posterior chest wall." (Fig. 2).

Bronchoscopy without anesthesia, general or local. All visible bronchi were found to be normal. With the aid of Dr. Willis F. Manges at the screen the needle was located in a small posterior branch of the inferior-lobe bronchus. The invaded bronchus was so small that only the smallest of the author's mosquito forceps could be insinuated into it. With this forceps the needle was seized as close to the buried point as possible, the point was turned out into the axis of the bronchus and withdrawn through the laryngoscope. Duration of bronchoscopy, five minutes.

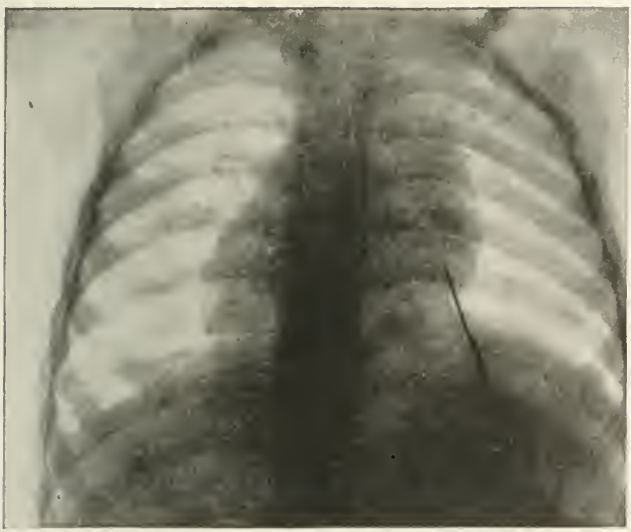


Fig. 2. Roentgenogram showing needle deep in the lung of a child aged two and one-half years. The needle had entered a tiny bronchus the orifice of which was out of sight. Removed by peroral bronchoscopy without anesthesia, general or local. Immediate recovery.

This case presented, I think, all the difficulties of the case of the 16 months old baby with the pin reported by me as a failure in 1914. The lodgment in a tiny bronchus even the orifice of which could not be exposed presented vastly greater difficulties than the mere inability to insert the bronchoscope into the invaded bronchus. The difficulty of finding the invaded bronchus, the extreme difficulty of grasping such an object under such circumstances and of freeing its point were presented in even greater degree by this case, than by the one in which I failed in the earlier days of the work. The surmounting of all of these difficulties in a bronchoscopy of only five minutes duration, and without

anesthesia illustrates, I think, the point I wish to make, that there are no fixed limitations to the constantly developing science of bronchoscopy. The limitations of the past are not those of today; the limitations of today will not be those of the future.

Of the failure of the shawl pin case it need only be said that we have since removed 15 of them. (Fig. 3). Of this number, 6 were deeper, in smaller bronchi much nearer the periphery, and presented greater difficulties in finding than were presented by the early case. In one case a shawl pin very deep down in the lung, after a sojourn of 28 years, was removed by peroral bronchoscopy in 3 minutes and 25 seconds.* There was no mortality in any of the cases of shawl pins and all made a prompt and complete recovery.

In the case of the bar-pin reported by me as a failure in 1914†, I do not know precisely what were the then insurmountable difficulties encountered by my predecessors in the case; but I understood them to be in the disentanglement of the foreign body. By the time the case reached me the pin had presumably entered a small bronchus, the orifice of which could not be identified either by me or by one of the most experienced bronchoscopists of the day, who made a search immediately subsequent to me. As one of my predecessors in the case was the discoverer of the feasability of bronchoscopy, and as in all there were four of us who failed, the case may be said to have marked very definitely the limitations of bronchoscopy in its then embryonic stage of development (1907). The hundreds of subsequent cases of vastly greater difficulty in which the foreign body has been easily and quickly removed illustrate the progress bronchoscopic technic has made.

As to the disentanglement of bar-pins the author has published‡ a case illustrating one of the successful methods of solving the mechanical problem. The problem of finding a foreign body deep down in the lung may be illustrated by the following case in which the foreign body was below the level of the dome of the diaphragm and presented also the vastly greater difficulty of finding a foreign body below a tissue barrier.

Case No. Fbdy. 659. Boy aged 8 years. When two and one-half years old, while seated at the dinner table, the child spat up a mouthful of blood. An attack of bronchopneumonia lasting one week followed, terminating in a chronic illness characterized by cough, purulent expectoration and hemoptysis. After about two years the hemoptysis ceased, but the cough continued and at intervals there was profuse purulent expectoration. The temperature was not

*Jackson, Chevalier. Symptomatology and Diagnosis of Foreign Bodies in the Air and Food Passages. Am. Journ. Med. Sci. May, 1921.

†Peroral Endoscopy and Laryngeal Surgery, Text-book. 1914.

‡A New Method of Working Out Difficult Mechanical Problems of Bronchoscopic Foreign-Body Extraction. The Laryngoscope. Vol. XXVII, Oct. 1917, p. 725.

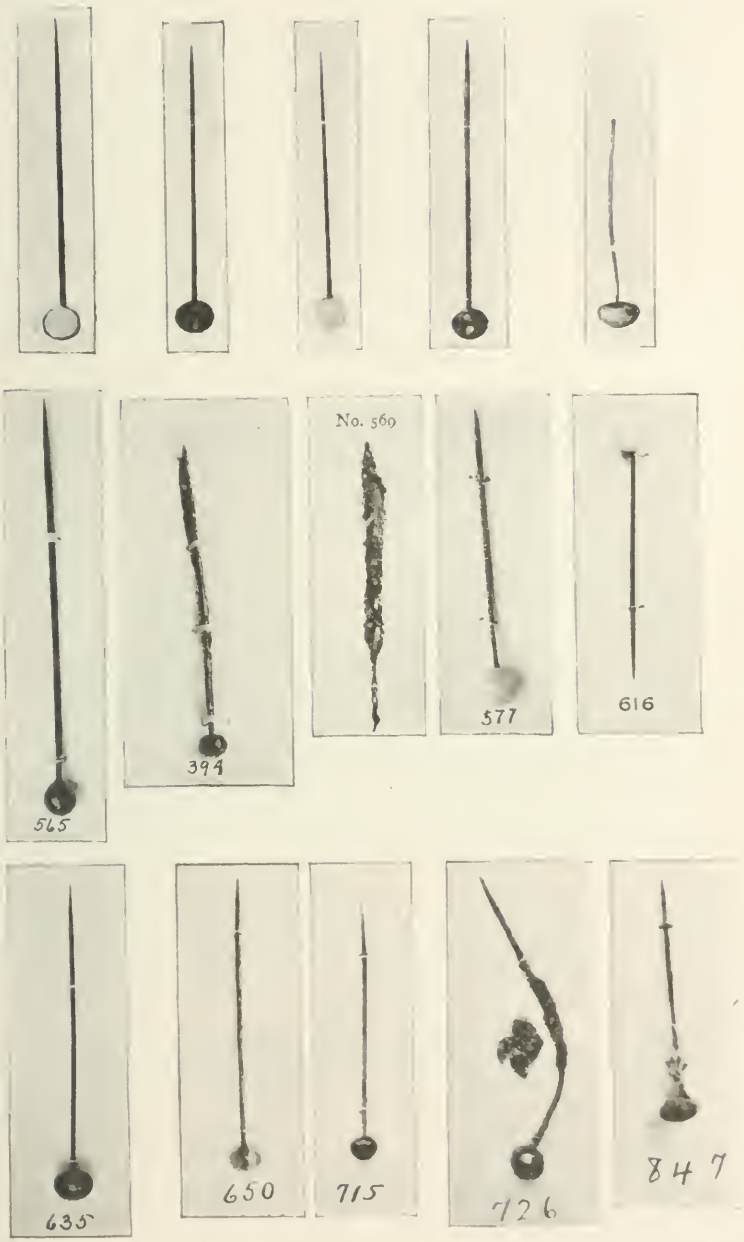


Fig. 3. Shawl pins removed from the lungs of patients at the Bronchoscopic Clinics.

noticed to be characteristically septic. Repeated sputum examinations were negative for tubercle bacilli. The diagnoses had been at various times bronchopneumonia, purulent bronchitis, bronchiectasis, and tuberculosis. The father, a physician, took the child for roentgenray examination, which revealed a foreign body very low in the right lung. Two bronchoscopies done by a very able man about a year before admission were failures.

Examination. On admission to the Bronchoscopic Clinic the boy was found under-developed, fairly well nourished, color good. Terminal phalanges of fingers and toes moderately enlarged (clubbed).

Physical Examination of Chest by Dr. Thomas McCrae: Less expansion lower right. Vocal fremitus little changed. Dullness at lower part practically going all round—in width about 1½ inches (due to diaphragm not moving as much as normal?). Above this there is a definite area of hyperresonance, almost tympany, in the axilla. On auscultation breath sounds are decreased at lower part over area of tympany; slightly more blowing than normal but the change is slight. No rales. No signs of cavity.

Roentgenray Report by Dr. David R. Bowen: There is a foreign body in the base of the right lung. It lies approximately one inch from the spine to the right and somewhat less than one inch in front of the tenth rib. In the plates made with the patient lying on the back, the inferior (also posterior) extremity of the foreign body lies below the level of the top of the diaphragm. In the fluoroscope the diaphragm shadow may be seen to rise so as completely to cover the foreign body shadow and to fall so as to completely clear it. The foreign body is slightly less than three-fourths of an inch in length and about one-fourth of an inch in diameter at its upper, larger and blunt extremity. From this it tapers to a rounded point. I have a suspicion that it is the steel tip which fits into a tubular umbrella stem. (Fig. 4).

Bronchoscopy without anesthesia, general or local. Connective tissue barrier at bottom of fistula. Small fistulae leading off laterally away from the direction of the foreign body. Connective tissue removed with biting forceps. Wound dilated so that forceps could seize the foreign body which was then seized with side-curved forceps and removed. Pus very foul after connective tissue barrier was removed. No true cavity found. Time required: 11 minutes 48 seconds.

Comment. During the nearly six years sojourn of the foreign body in the lung it had worked its way by pathologic process from the orifice of the right main bronchus to the bottom of the lung.

Conclusions.

1. There are no fixed limitations to the peroral bronchoscopic removal of foreign bodies that have gone down into the lungs through the natural passages.

2. Projectiles that have gone in through the chest wall may be too large to be brought up through the natural channels;* but

*This statement was made on theoretical grounds. Since it was written the author has demonstrated that penetrating projectiles that have entered through the chest wall can be removed through the mouth by bronchoscopy. He thus removed, under local anesthesia, a bullet that had entered between the seventh and eighth ribs posteriorly and had lodged in lung-tissue, not in a bronchus.

any localizable foreign body of appreciable size that has gone down through these channels can be brought back the same way; quickly at the first bronchoscopy in easy cases; at subsequent bronchoscopies in the difficult cases.

3. If mortality be avoided, patient, concentrated work with rubber tube manikin, dog and cadaver will eventually solve any problem of bronchoscopic removal of any localizable foreign body of appreciable size. Obviously a small piece of pneumoconiotic material or a very small fragment of peanut kernel, for instance, may get into a tiny branch bronchus and therefore may not be localizable.

4. The bronchoscopic failures of ten years ago are no criterion of the peroral bronchoscopy of today. At that time the aeroplane

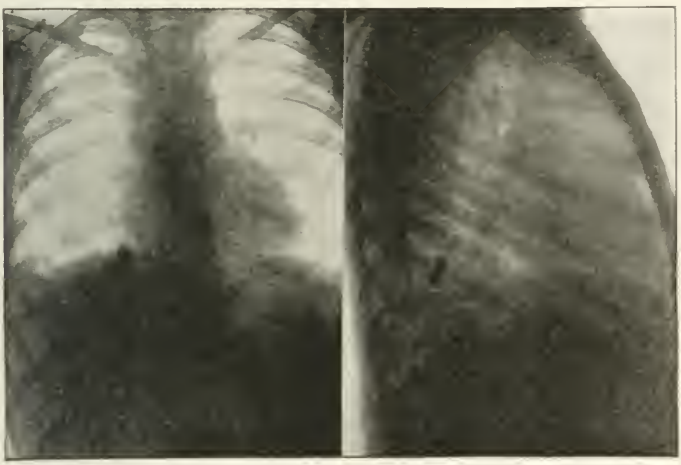


Fig. 4. Roentgenogram showing a metallic foreign body deep in the lung of a boy aged 8 years. Considering the depth of the foreign body, in the liver shadow below the level of the top of the dome of the diaphragm, and the superjacent tissue barrier that had to be circumvented, the successful peroral bronchoscopic removal without anesthesia, indicates that there are no fixed limitations to the peroral bronchoscopic removal of foreign bodies from the lung.

would not leave the ground; now it flies over the mountains and the oceans. Bronchoscopy in its small way has advanced relatively as much.

MALIGNANT NEOPLASM OF LARYNX AND ESOPHAGUS TREATED BY RADIUM.

By HENRY HALL FORBES, M. D., New York City.

The two cases of malignancy presented, one of the larynx and one of the esophagus, are typical of a series of thirty-six or more non-operative neoplasms which have been under treatment at the New York Post Graduate Hospital, by me in conjunction with the Radium Department. To the members of the Society they would seem to me to be of further interest as all the cases have been treated or rather the applications of radium have been made by a member of the Department of Diseases of Nose and Throat: this work has fallen to my lot through the kindness of the director of the service Dr. Duncan Macpherson. The application of the radium needles to the laryngeal growths, both intrinsic and extrinsic, as well as the examinations were made during the earlier part of the work under suspension laryngoscopy. At present all applications to the larynx are being made by the use of the Jackson laryngoscope with patients on the table in the position used by Dr. Johnson of Baltimore. The applications to the upper part of the esophagus or hypopharynx being made through my modified Jackson esophageal speculum. The growths lower in the esophagus are being examined and treated by the regular esophagoscope. It seems hardly necessary to emphasize the advantages of this method of examination and the ease with which it has been possible to apply the radium in what to us seems a scientific manner, precision in diagnosis, location and the ease with which the progress of the disease and the results of the treatment are noted. Dr. Willis who has charge of our radium feels that the application of the radium is still as far as dosage is concerned and also the utilization of the Beta or Gamma rays, to be still very much in the experimental stage. We are also in doubt as to which method of application is best, emainations of the radium itself. We have used the needle availing ourselves of both the Beta and Gamma rays and we have used the protected or screened tubes giving us the Gamma rays alone. A seeming disadvantage in our work with the needle has been an occasional abscess due we think to the introduction of the needle through an ulcerated and infected surface. One of the dis-

advantages of the use of the Gamma rays alone has been the added length of time which is necessary with the protected capsule, usually ten times as long as exposure is necessary as compared to the application of the needle into the growth itself. This in laryngeal and esophageal cases has been a difficult problem. Attempts are now being made to render fields as sterile as possible before introducing the needles, this doing away in great part of the infections. Although this method of application of radium to malignant neoplasms is new to me, the members of the Society will remember the suspension method was used both by Dr. T. J. Harris and myself in applying radium to cases of papilloma of the larynx in both adult and child.

It will be well to note that specimens have been removed in a number of our ulcerative cases but only after a preliminary radium exposure. Also that I believe an early tracheotomy is indicated in all cases where dyspnea is present; further, in esophageal cases early gastrotomy is of great value in all obstructive esophageal lesions. The morale of all patients is improved following radium treatments and the pain does seem to be less. The results of the treatment are not clear enough in our minds to give any positive data as to results; it must be emphasized that all these cases were considered inoperable. We feel however, encouraged and that we should continue our work, and that greater care will be used in the selection of the cases, for we have found as others, that all patients do not benefit by treatment and that even harm may be done.

The first case is that of a man 38 years of age with a carcinoma esophagus. Wassermann was negative. X-ray diagnosis esophagal obstruction and tumor formation at lower end. First treatment Sept. 22, 1920. Observation: Obstruction; non-ulcerative irregular mass; at distance of 38 cm. from teeth. Application: needle 10 mg. Screenage gold 4 hours.

2nd Oct. 25. 10 mg. 3 hours.

3rd Nov. 11. 10 mg. 3 hours.

4th Dec. 8. 10 mg. 3 hours.

5th Jan. 5. 10 mg. 3 hours.

6th Jan. 26. 60 mg. tube, screen ½ m. gal. 2m hard rubber, time 4 p. m to 8 p. m.

Slight hemorrhage at one application, needle immediately pulled out and reapplied later. December 8th observation; marked diminution in growth and areas of scar tissue. This patient has not only maintained his general condition but gained in all 8-9 pounds.

Recent observation in May showed the growth had apparently disappeared.

The second case, a laryngeal carcinoma in a man 67 years of age was unfortunately under local treatment and observation for several months before he was referred to the radium department for treatment. A tracheotomy had been necessary. He has been under treatment since November 1920 and has had in all five treatments by needle. The growth is extrinsic, in the right pyreform sinus and completely hides larynx by indirect examination. The general condition of the patient as well as local condition has improved. (Recent observation in May reafirms the progressive improvement in both general and local condition).

USE OF RADIUM IN MALIGNANT GROWTHS IN THE NOSE AND THROAT.

By W. L. CULBERT, M. D., New York City.

I. Sarcoma of the Inferior Turbinate.

The patient (Mr. P.), a man of about fifty, was referred by Dr. Becker of Troy, with the following history: The right nostril had been completely occluded by an unusually large right inferior turbinate body; under local anesthesia Dr. Becker removed a specimen for examination. Operation was followed by profuse hemorrhage which was controlled by packing the nose. The pathological report was: Small round cell sarcoma.

At first examination I found a complete occlusion of the right nostril. A tube of radium emanation was plunged into the anterior part of the right inferior turbinate. In two weeks' time there was a noticeable subsidence of the swelling; two weeks later, there was a still further decrease in size; the growth continued to regress. Later there was a recurrence which again occluded the nostril; no glands were involved.

Radium was applied a second time in the following manner: A catheter was passed back through the nose and brought out through the mouth; radium was inserted and tied into the end of the catheter, which was then pulled forward through the nose far enough to bring the radium to the back of the nose, where it was left for two hours; it was then pulled one-half inch further forward and left two hours; and finally it was brought again one-half inch further forward and left for two hours. In this manner all of the turbinate body was exposed to radiation for two hours' time. The catheter was anchored each time to the face by plaster. Following this treatment there was a complete retrogression. The patient breathed much more easily and experienced great local and general improvement.

Later on metastasis occurred in the abdomen, and the patient is nearly dead, if he has not already died. There was no local recurrence of the original trouble.

II. Epithelioma of the Larynx.

S. B., a man of fifty-two, October 17, 1919, stated that nine months previously he had taken a hard cold, and had used his voice in singing and shouting at this time. He had become hoarse and had been so ever since; other than the hoarseness he had experienced no discomfort. Other specialists had advised laryngectomy which he positively refused.

Examination of the larynx showed a small growth below the anterior portion of the left vocal cord; some thickening of the tissues around it; a gland felt on the left side of the larynx. Examination of the sputum and the blood was negative; the Wassermann was negative; a white cell and differential count was normal; there was no plasmodia. K. I. was ordered as routine treatment, and the mouth was tied shut at night.

Radiographs of the larynx showed a gland on the left side, and a dense area in the thyroid cartilage which in Dr. Law's opinion was either a calcareous deposit or a new growth. Under local anesthesia a preliminary low tracheotomy was performed below the isthmus, and the tube inserted; there was practically no bleeding. As laryngectomy was out of the question with this patient, radium under direct laryngoscopy was applied within the larynx over the new growth for one hour. Laryngoscopy showed an ulceration on the left side, apparently typical of epithelioma, of which several small specimens were removed for examination. The pathological report was: Typical epithelioma with very few pearls.

Two weeks later, at the General Memorial Hospital, radium amounting to 3,000 mchrs. was applied by a lead tray externally first to one and then to the other side of the larynx. Following this, the ulceration and swelling diminished considerably. Three weeks later, January 14, 1920, under chloroform anesthesia, radium was again applied to the surface under direct laryngoscopy, 200 mgs. for one-half hour. This treatment was followed by a radium reaction. By March 19 all ulceration had healed except a small knob under the anterior extremity of the *right* vocal cord. Further laryngoscopic examination showed a much smaller mass than formerly, located at the anterior commissure below the vocal cords. To this area 275 mgs. of radium were applied for one-half hour. Four weeks later, again at the Memorial Hospital, 1587 mchrs. of radium were applied by a lead tray externally to the alternate sides of the larynx.

There was considerable reaction; a white slough began to appear in about a month's time. At the end of the second month examination, under general anesthesia, showed considerable cicatrix and a small nodule of granulation tissue which was removed for examination. The pathological report was simple granulation tissue.

By the end of June the tracheotomy tube was removed, and a week later the wound was healed. Under direct laryngoscopy, no evidence of disease could be found. The patient had gained over twenty pounds in weight, and left for Maine a few days later.

Eight weeks later, after having had a severe cold and threatened pneumonia, he returned coughing and with spasmodic attacks of dyspnea, though breathing comfortably between attacks; he had lost weight. The tracheotomy tube was inserted at the site of the old wound with subsequent improvement in strength and weight. Examination of the larynx showed a small nodule protruding from the left ventricle, evidently a recurrence above the original site. Dr. Forbes, in consultation, advised continuing radium treatment by using needles containing the radium salts. Accordingly, under local anesthesia and by direct laryngoscopy, Dr. Kernan plunged two needles, each containing 10 mgs., directly into the mass; these were left in place for two hours. A specimen removed at this time showed under microscopic examination to be epithelioma of the basal cell type. Radium was also applied externally over the larynx by Dr. Willis.

Several weeks later, under general anesthesia, three needles, each containing 10 mgs. of radium, were inserted into the mass for three hours. Following this treatment there was a severe radium-reaction with swelling and inflammation. Later the swelling broke down, and there was evident fluctuation. In consultation with Dr. Abbe, we considered that the best procedure would be

to clean out this abscess and, at the same time, to curette out all possible diseased tissue, including the arytenoids. Consequently, December 19, an incision was made from the chin to the tracheotomy wound and transversely at the level of the thyroid cartilage, and as large a curettage as possible, including the arytenoid cartilages, was done. There had been an escape of a large quantity of pus at the linear incision. Radium was held in the wound for one-half hour. The tube was passed through the nose into the esophagus and fixed in place for feeding. The wound was packed and stitched.

January 3, 1921. The esophageal tube is still in place. When the wound is dressed, in the lower part of the wound at the point of severing of the trachea, unhealthy granulation tissue with the typical appearance of carcinoma is seen. The cancer is undoubtedly recurring.*

There is no question of the efficacy of radium in superficial skin malignancy, and in non-malignant growths of the mucous membranes, as in papilloma of the larynx. In malignant growths of the mucous membranes, especially of the nose and the larynx, its efficacy has yet to be proved. In the first case here described, the local growth in the nose was cured, but the sarcomatous growth was not prevented from metastasizing elsewhere.

In my limited experience, better results (i. e., with less destructive reaction) have been obtained with the surface application of radium element or emanation than by imbedding needle containers holding radium salts or radium emanation needles. With our present incomplete knowledge of the action of radium, the insertion of needles into the growth appears too frequently to produce an over amount of necrosis likely to lead to the formation of abscess. Further experimentation will probably devise methods by which the action of the radium will be held under more complete control.

*Patient died on recurrent growth of cancer on June 7, 1921.

PRIMARY ADENO-CARCINOMA OF THE BRONCHUS.

By CHARLES J. IMPERATORI, M. D., New York, N. Y.

A. C.; 50 years; married; waiter; native of Hungary. Admitted to Bellevue Hospital March 27, 1920.

Family History: Is negative in so far as carcinoma or tuberculosis is concerned.

Previous History: Had pneumonia when 12 years old; otherwise has never been ill. However, was never strong and vigorous. For the past ten years has felt weak and usually tired. Denies lues.

Summary of Present Illness: I. Poor health with onset of weakness, beginning ten weeks ago. II. Cough progressively worse with increased expectoration. III. Fever. IV. Night sweats. There has been no pain in the chest and no expectoration of blood.

The essential points of the physical examination were as follows: I. Pyorrhoea alveolaris. II. Poorly nourished anemic male. III. Long phthisical shaped chest with signs of fluid or an encapsulated mass at the right base. IV. Heart, endocarditis compensated. V. No clubbing of fingers. VI. Laboratory findings: Urinalysis, negative; septum examination for T. B., negative, no characteristic odor of lung abscess to sputum.

Radiographs that were taken at four different times over a period of five weeks show: Infiltration at right apex; congestion right and left upper lobe; interlobar plastic pleurisy; marked thickening of pleura right base.

The patient had, now, been in the hospital about two months, practically all of this time being a bed case. During this time ten sputum examinations had been made, the last two being done by the antiformin method, all with negative results.

Another radiograph taken at this time, May 20, 1920, gave us a diagnosis "abscess of the lung and bronchiectases." Over this period of two months the patient had been aspirated four times and twice the fluid—which was always small in amount—was examined for T. B., with negative results.

On May 22nd the medical men requested that a bronchoscopic examination be done. The examination was done under local anesthesia and the findings are noted below: "Within the right bronchus near its termination, about 5 cm. from carina to the right and anteriorly there is a mass of granulation tissue about 1 cm. in diameter through the center of which pus is coming. Some bleeding on touching, but appears soft in consistency. The tip of the bronchoscope entered a cavity—the outline or depth was not made out."

At this time the patient was transferred to the Oto-laryngological service and the history continues as follows:

The chief complaint of the patient was that of cough and expectoration of six to eight ounces daily of muco-purulent material the odor of which was not offensive.

Temperature ranged between normal and 100°; Pulse 70 to 110.

Usually comfortable and complains very little.

A report at this time of the secretion obtained from the right bronchus was negative for T. B., although it showed many diplococci that hemolized blood agar.

May 24, 1920—Bronchoscoped—local anesthesia. The cavity easily entered to a depth of over 3 cm. was washed out with saline solution.

May 28, 1920—Was again bronchoscoped and cavity irrigated with saline, then injected 5% bismuth oil, two drams.

These bronchoscopic irrigations were done on June 6th, 12th and 28th. In all he had five bronchoscopic irrigations—the first bronchoscopy simply being an examination.

After the second irrigation, the granulation tissue noted at the original examination disappeared almost entirely—the abscess cavity being easily entered.

The sputum became less thick and lessened in amount, about four ounces daily.

The patient was up and about the ward and gaining strength daily. In the early part of July he was sent to the country to the Burke Foundation in Westchester County, where he stayed until September 21, 1920.

He was readmitted to Bellevue Hospital, Sept 21, 1920 and was in about same physical condition as in July, excepting that the amount of sputum had increased to about eight ounces.

Bronchoscope examination done Sept 4th, 1920 was the same as of June 28th.

Daily intratracheal injections (*) were given until October 15, 1920. These were done by the house staff and by the indirect method.

Seven bronchoscopic irrigations and injections of bismuth oil were done from October 15th to November 20th.

(*) Rx

Atropin	gr. i
Adrenalin Inhalant	oz. iii
Menthol	gr. xl
Camphor	gr. lxxx
Oil Sweet Almond	oz. iv
Liq. Petrolatum	oz. xii

After the second irrigation the sputum was much lessened, being usually four ounces per diem.

Radiographs taken at this time confirmed the former ones.

There is a large abscess at the base of the right lung in which the horizontal fluid base is easily discernible. This abscess developed on the basis of a large bronchiectatic condition of the lower lobe. There is also a small amount of effusion in the right pleural cavity.

On November 20th on bronchoscopy a white mass about 6-7 mm. in size was seen protruding into the bronchus from the region of the abscess cavity. To the tip of the bronchoscope it appeared hard. A piece was removed and sent to the laboratory for examination. The report returned was that the section very strongly suggested adeno-carcinoma.

The following week, November 28th, on bronchoscopy the mass had increased to over 15 mm. in size, almost blocking the lower part of the bronchus. Another piece of tissue was removed for confirmatory diagnosis.

The report returned by Dr. McWhorter of the Bellevue Laboratories is as follows:

December 8, 1920—"Section from one of the pieces of tissue show an infiltrating mass of epithelial cells. These cells are arranged either in the form of a sheet or have a primitive glandular arrangement. The cells vary greatly in size and shape, but for the most part resemble the glandular type of cell. The nucleus is very deeply stained and shows mitotic figures.

Diagnosis—Adeno Carcinoma."

It was then decided after consultation, with Dr. Coakley, the Director of the Oto-laryngological Service, and Dr. St. John, the Director of the Surgical Service, that further treatment intrabronchially was futile, and on December 22, 1920, the patient was transferred to the General Memorial Hospital. Here Dr. Quick applied radium four times. In all the patient received 44,000 M.C. hours of radium. However, he progressively lost strength and died January 22, 1921, from a terminal bronchopneumonia.

An autopsy showed organs essentially normal with exception of lungs. The pathologist, Dr. Ewing, reporting as follows:

"Lungs—Left is congested, edematous. Right lung is firmly bound by old adhesions, especially dense over base and around hilus. Several large pockets of fluid are inclosed in layers of pleura. At the second bifurcation of right bronchus there is a solid polypoid tumor mass, 2 x 3 cm. arising from bronchial mucosa and wall and projecting above into dilate bronchus. The lower lobe consists of a series of cavities lined by granular necrotic tissue and supported by firm connective tissue septa, between which there is some diffuse smooth hepatization. There is an intense purulent bronchitis in both lungs. The trachea seems very wide.

Sections show the tumor to be a very cellular adenocarcinoma with areas of squamous cell growth. It probably arises from the bronchial mucosa.

In several portions of the lung tissue about the tumor and throughout the necrotic lobe there are active miliary tubercles and some areas of caseation.

The interesting features of this case are summarized below:

1. The endoscopic observance of the growth.
2. The rapid growth of the cancer, after biopsy.
3. The negative sputum examinations in the presence of a moderately active tuberculosis.
4. A bronchectatic cavity undergoing malignant change.
5. There was no metastasis.
6. Death of the patient within two months of the onset—that is, from the time of observance.

In general, primary adenocarcinoma of the bronchus is not common. Seydel, Munch. Med. Woch, March, 1910, reported 184 cases of malignant tumors of the lung and pleura from an analysis of 10,829 autopsies; of these 73.4 were metastic growths, 9.8 by direct extension to the lung from neighboring tissues and 16.8 were primary growths. Males were affected four times more frequently than females and tuberculosis was a frequent association.

Primary cancer of the lung possesses but a feeble tendency to metastis.

THE TREATMENT BY RADIUM IN THREE PATIENTS WITH MALIGNANT NEOPLASMS OF THE UPPER AIR TRACT.

By WOLFF FREUDENTHAL, M. D., New York, N. Y.

Lympho-Sarcoma of Tonsil.

A. S., a laborer, 50 years of age, has been well up to about ten years ago, when he began to suffer from rheumatism, which still troubles him on and off, especially in winter. His present illness set in a year ago, when he commenced to feel a fullness in his throat. This has been increasing in intensity, and of late he has been suffering from pain in deglutition. He is married and his wife gave birth to three healthy children, miscarried once. There are no signs of lues to be found. The Wassermann test was made three times, on both himself and wife, and always was negative. He never received any antiluetic treatment.

On examination the patient was found to be a rather muscular, well nourished man. His voice was muffled and his main complaints were the difficulty in swallowing and his vocal disorder. There was no dyspnea. On looking into the throat a big, round mass was seen springing up from the supratonsillar fossa and extending between the pillars of the left tonsil downwards. It was not sessile in its entirety, but a small portion could be lifted up. A piece of the tumor was removed for examination, and even this intervention was followed by a good deal of bleeding.

The report of the pathologist was that we had to deal here with a case of lympho-sarcoma of the tonsil. A few days later it was decided to operate on him, that is, to remove the superabundant neoplastic tissue from the tonsil. The fact that this was not entirely sessile gave me the idea of snaring it off with the cold snare. This was done under local anesthesia with the head down. I was prepared for a good deal of bleeding, having my galvano cautery ready as well as the soldering iron which was used by Dr. New in his operations on the antrum. However, I did not intend to use the soldering iron except in extreme necessity, since one never knows when he may strike a large blood vessel in the tonsil. In the antrum this procedure is easier and safer. It took about 20 minutes to snare off the mass and an abundant hemorrhage followed afterwards; but by different measures including the galvano-cautery it was arrested. Then orthoform powder was applied to relieve the after-pain and the patient put to bed. A good deal of oozing occurred during the night and the following day, but it was never alarming. On the fifth day patient was discharged from the hospital feeling comfortable. Two weeks later he returned and radium treatment was commenced. Twenty milligrams of pure radium well screened were applied directly to the affected tonsil two hours daily for six days, the patient lying on his left side. A small portion of the neoplasm was still visible. It was apparently overlooked when the hemorrhage supervened. The patient went to his home in the northern part of the state, returning three weeks later. The tonsil looked clear, even the small portion of neoplasm was gone. The same applications of radium were made as before. Three

months later he again returned to New York, his voice being clear and no dysphagia being present. Exactly the same treatment was applied and patient left again for home. Voice clear, no dysphagia and the tonsil shrunk extensively. There is no recurrence, 34 months having elapsed.

Epithelioma of Larynx.

Case 2. U. S., 46 years old, a tailor by occupation, complained of hoarseness that had been present for a year and a half. He had been examined by several laryngologists of this city and the diagnosis of malignancy made by every one of them. According to him no Wassermann had been taken, but at my request it was done now, and proved to be negative.

The laryngeal image was typical for malignancy. There was an irregular mass on the left vocal cord occupying almost its entire anterior half. On top of it was a small ulcer, which caused some dysphagia. Laryngofissure would have been indicated in this case, but the patient refused. It was then my intention to remove the growth intralaryngeally, but various conditions, especially the ulcer, led me to give him a preoperative application of radium. This was done, and as I believe successfully. For, three weeks later, the ulcer had healed, while the infectious process that was going on, had disappeared. Besides, the mass seemed more accessible and perhaps smaller. It was then removed by the indirect method and examined microscopically. The report was epithelioma. The next and most important step was the postoperative treatment by radium. Twenty milligrams of pure radium were applied for 12 hours on the outside, screened by 1¼ mm. of metal and well covered with rubber tissue. One week later 50 milligrams of radium was applied intralaryngeally for two hours every third day, altogether ten times or 20 hours. The patient failed to return until five months later, when a new growth had occurred. This time I removed it at once and applied radium in the same manner as above, that is, first externally for 12 hours, and then intralaryngeally two hours at each sitting and altogether ten times. The voice improved somewhat, but always remained husky. The last I heard of the patient was six weeks ago today, or one year after the last application of radium, when he was reported by his family physician to be in good health. His voice continued husky.

Case 3. M. P., 56, an iron worker, had had trouble with his throat for the past eight or nine years. Since nine months ago his voice had been very bad and he suffered from shortness of breath on slight exertion. I examined him by the indirect method, which was not satisfactory in this case. Then suspension laryngoscopy was used and a very clear picture of the larynx could be seen. Extending from the anterior commissure there was a smooth, dark looking sessile growth on the right vocal cord reaching backward to about ¾ of the cord and spreading downwards into the trachea for about half an inch or a little less. The left side was similarly affected, but to a lesser degree. As he objected to a total laryngectomy as well as to a tracheotomy, I immediately removed under suspension laryngoscopy a large portion of the tumor from the right side, which was quite easy in this instance. His breathing improved at once and he was put to bed and watched all night. Fortunately no edema of the glottis nor anything else that was unpleasant occurred. A week later the rest of the neoplasm from the right side was excised with Killian's forceps and again one week later the one from the left side was

removed. All these specimens were examined microscopically and found to be epithelioma. Then radium was applied just as in the case narrated, with the exception that 150 milligrams of radium were used. Three months later there was a distinct recurrence on the right side. Again it was removed under suspension laryngoscopy. This was followed by a great deal of bleeding. Radium was applied once more and patient watched carefully for several weeks. I lost track of him then for about ten weeks. This time the dyspnea was marked and I did not care very much to operate intralaryngeally. But at the patient's urgent request I had to do it, being prepared, however, for an emergency tracheotomy. Big masses were removed and the hemorrhage was worse than at the last operation, but finally was controlled. Metastases had appeared and patient died a few months later.

In a small percentage of cases of malignant disease an operation alone will bring about a cure, but only in a very small number of instances, and when the operation is done at an early stage and all the diseased tissue removed. As this can be done very rarely, a prophylactic raying by radium or Roentgen rays is indicated to prevent, if possible, a recurrence.

The pre-operative application of radium is also advisable in certain cases.

A CASE OF ANGIOMA OF THE LARYNX.

By THOMAS J. HARRIS, M. D., New York City.

L. F. aet circum 30, was seen by me for the first time some five years ago, complaining of occasional hoarseness and having expectorated on one or two occasions a slight quantity of blood. Examination showed a dark colored, pedunculated growth the size of a large pea attached to the anterior third of the right vocal cord, which during ordinary respiration was out of sight, but on deep expiration came clearly into view. The patient complained of no pain in the throat and was able to pursue his avocation as a school teacher without any difficulty.

Removal of the growth was advised and carried out by the indirect method by means of a snare. No hemorrhage followed the operation. The report of the laboratory was a hemangioma, cavernous type.

Three years later there was a recurrence of the growth at the same point. Radium was applied externally without effect, and the growth was removed in the same manner as before by means of the laryngeal snare. Two years later, a second recurrence took place, brought to the patient's attention as on previous occasions by a slight expectoration of blood. This time the growth was much smaller and distinctly sessile. It was removed by suspension laryngoscopy without hemorrahge or other reaction. One week later 102 milligrammes of radium were applied to the site of the growth for thirty minutes by the indirect method, and 185 milligrammes externally for three and one-half hours.

Comment. Angioma of the larynx is a rare form of growth, several articles have appeared in the literature recently including one by Dr. Emil Mayer and still more recently one by New and Clark, (Annals of Otology—Vol. 1919 page 1025) who have collected in the literature including three cases of their own, 55 cases, of which 47 are hemangiomas and eight lymphangiomas. Our own case makes 48 cases of hemangiomas reported to date or a total of 56 cases of angiomas. All articles on the subject refer to the liability of hemorrhage in connection with the operation and on that account Mayer advises laryngo-fissure, while New and Clark based upon their own experience recommended radium as the proper

procedure. Our own case is remarkable on two accounts: first, the complete absence of hemorrhage during all the operations and second, the recurrence of the growth, which so far as we can discover is not entirely an exception. The microscopic examination of all three specimens was the same.

MEETING OF THE MIDDLE SECTION, HELD IN CHICAGO, ILLINOIS, FEBRUARY 22, 1921, UNDER THE CHAIRMANSHIP OF DR. JOSEPH C. BECK OF CHICAGO.

THE END RESULTS FOLLOWING OPERATIONS FOR CHRONIC SINUS DISEASE.

By WILLIAM E. SAUER, M. D., St. Louis, Mo.

No one can approach this subject without a feeling of reluctance on account of its magnitude and the complexity of the factors involved.

End Results—at least good end results—are what the patient seeks, the physician too, for that matter. With unfortunate end results the patient is concerned purely from a personal standpoint, while the physician, apart from his own personal interests has also the important scientific side to consider. He must determine the causes of any unpleasant outcome of his operative procedures and devise methods of preventing them.

Here the question arises, "What constitutes end results?" Shambaugh lays emphasis on the fact that moisture in the ear or a little discharge after a radical mastoid operation does not mean failure. So we may say of our sinus work, that though there may be some discharge, if the process has been checked and the major symptoms relieved, there is no reason for considering that the operation has failed. Better a slight discharging frontal sinus without other symptoms than an obliterated one, and a greatly reduced maxillary discharge with relief of symptoms, than to pursue the more radical and often disfiguring operation, in order to have an absolute cessation of the secretion.

In general the results of operations on the paranasal sinuses depend upon the following:

1. Character of the pathologic process.
2. Physical condition of the patient.
3. Operative procedure.
4. Skill of the operator.
5. After-treatment.

1. The character of the pathologic process has a most important bearing on the end results. Two types are recognized as

pathologic entities: viz. the non-suppurative (hyperplastic) and suppurative varieties. In general, the non-suppurative give better results than the suppurative.

The duration and the extent of the process are also determining factors in the outcome, for we expect better results in the more recent cases, other things being equal. In cases where the suppurative process has been of long standing, marked degenerative changes of the lining mucous membrane are apt to be present or even a necrosis of the underlying bone, while in early cases there is usually only a moderate degree of involvement.

The end results also depend upon whether there is a single or multiple sinus affection. For example: An attempt to eradicate a diseased condition of the frontal sinus without regard to an existing ethmoid suppuration, is sure to give a disappointing result. The same may be said with regard to a diseased antrum in which the infecting agent is alveolar.

Previous operations, with new connective tissue formation causing the landmarks to be obliterated or obscured, make a good result questionable and sometimes impossible.

Syphilis of the nose likewise may have wrought changes making it difficult to operate with the success otherwise warranted or it may interfere with the reparative process. The end results in atrophic rhinitis have proven generally unsatisfactory, to the patient at least, notwithstanding the occasional reports of flattering results. In osteomyelitis of the bony walls of the sinuses the prognosis is bad if the diseased bone cannot be removed completely.

The morphology of the sinuses is also an important factor. A diseased condition of a small frontal sinus can be more easily eradicated than in a large sinus in which there are numerous pockets and septa. The same is true of the ethmoid cells. In those cases where the ethmoid cells are not extensive and within reach, a good result is fairly certain, but when the cells are numerous and extend over the orbit or over the maxillary sinus where they are inaccessible to intranasal operative procedures, the chances of success are much less.

Radiography has proved a most valuable aid in determining the size and contour of the sinuses and the presence of pathologic processes. It has become a method of routine examination and no one who has a due regard for end results would attempt any extensive operative work upon the sinuses without having given serious study to the findings as revealed by a stereo-radiogram. This is especially true of the maxillary, frontal and

anterior ethmoid cells. I mention radiography with all due regard for the multitude of complaints which are made relative to its value. However, improper technic and faulty interpretations are usually the basis of the lack of its efficiency. While negative findings are to some extent to be disregarded, especially in the presence of clinical evidence of disease, it must not be overlooked that positive findings frequently depend upon the over-zealousness of the interpreter rather than upon the pathologic process.

A discussion of the end results would be incomplete without referring to the fair number of cases in which the procedure partakes of the nature of an exploratory operation. These should be undertaken after due deliberation and weighing of the evidence. Headache, pain in remote regions and other symptoms may, for instance be dependent upon an ethmoidal inflammation without any marked local evidence. If all other sources have been carefully studied and excluded, it may be well to undertake a simple curetment of the ethmoids.

Observance of such practice will obviate the criticism of Cushing who calls attention (January A.M.A., July 24, 1920) (Transactions of the A. L. & R. O. Society, 1920) to the indiscriminate opening of the ethmoids and sphenoids in cases of choked disc. He states that in the last twelve months many patients with brain tumors have appeared in the Peter Bent Brigham Hospital Clinic, who recently had undergone radical operations for assumed affection of the sinuses. Cushing further states that he is often urged to see patients in consultation who are in extremis from meningitis, following what were supposed to have been trifling intranasal operations. Shambaugh, in discussing Cushing's paper, deplores the looseness of our work on the nose and states that we ought not to be in doubt and that if there is intranasal trouble there should be enough evidence for us in the nasal sinuses or in the radiograph.

Without in any way attempting to defend looseness of observation, there is this to be said, that Cushing speaks "after the fact" and hence has the easier side of the argument. Furthermore, we might ask if there are not exploratory brain operations performed which were, in the light of what comes afterward, wholly unjustified?

2. The Physical Condition of the Patient has an unfavorable influence on the end results particularly in tuberculosis and syphilis. Even if the sinusitis is only an independent infection, whatever the treatment employed, the result will often be disap-

pointing if the patient has an extensive process in the lung, and more so if the sinus disease is due to a tubercular process of its bony wall (this is a rare occurrence) and lining membrane.

Syphilis has long been known to have a bad effect on the end results in any form of treatment of sinus disease. In spite of intensive and prolonged antisyphilitic treatment, these patients will not do well. If the luetic process in the nose has been extensive, the formation of crusts will continue in spite of all efforts. Therefore, any operative work on syphilitic individuals should be seriously considered. This is especially true of any operative work on the frontal sinus and ethmoid cells, on account of the danger of starting an osteo-myelitis.

In chronic nephritis and diabetes the results are often unsatisfactory, in fact they are poor operative risks.

The age of the patient must also be considered. It is comparatively recent that attention has been paid to sinus disease in children in whom such operations were generally tabooed. Dean (Transactions A. L. R. & O., 1920) who has done much to change this view, says that 80 per cent. of the chronic cases of sinus disease in children are cured by removal of adenoids and tonsils. Usually general tonic treatment, suction, cleansing and in some cases puncturing the antrum are sufficient; but where an occasional severe complication, as an orbital abscess or a general infection occurs, operation must be resorted to and the end results are as a rule satisfactory.

In the aged the disposition is to let well enough alone unless complications threaten. These patients, unless subject to some definite disease contraindicating operation, bear operation better than was formerly supposed.

3. Operative Procedure. The end result often depends on the operation performed and upon the skill of the operator. The aim of all operations on the sinuses is definite and complete drainage. This may be accomplished in most cases intranasally; in some, however, an intranasal operation will be required. Taking the sinuses separately we have found in the maxillary sinus that when the sinusitis is of dental origin, the removal of the tooth with a curetting of the infected area in the alveolar process, together with irrigation of the antrum, will relieve the majority of cases. Those cases of long duration, whether of dental or nasal origin, will in many instances clear up by making a large opening into the nasoantral wall under the inferior turbinate without sacrificing the turbinate. This failing, the

Caldwell-Luc or Denker method may be employed. Personally I have not been doing the Denker in recent years as the same result can be obtained with the Caldwell-Luc and the reaction in the latter is decidedly less. I have no experience with the obliterating operation of Beck.

It is generally conceded that practically 90-95 per cent. of the cases of frontal sinusitis respond favorably to intranasal operative measures, removal of middle turbinates and curetting of the ethmoid cells. The remaining 5-10 per cent. will require some kind of external operation. Some will respond to the method of enlarging the natural opening—either the Halle or the Good operation. Of the external operations the modified Killian has proven the most satisfactory in my hands. The Lothrop with modification is advocated by Beck and Moore. I have no personal experience with this operation. The opening of a healthy sinus has not appealed to me.

The end results following operations of the ethmoid labyrinth are as to perfect results generally disappointing. Skillern in a recent article has given us a plain statement of facts bearing on the results obtained today. He makes a strong plea for conservatism. His experience so coincides with the writer's that the following quotation will be sufficient.

"The outcome of the extensive operations in which the opening of the sphenoid is included is that either we have succeeded in reaching all the diseased areas and brought about a cure or that the patient returns later with a most intractable suppurative ethmoiditis, the patient being in far worse condition than prior to the operation. The ethmoid region is bathed in pus which does not seem to take its origin from any particular locality but fairly exudes from the whole of the operative field. We have by our operation changed the primary condition which was an infection of one or more, possibly a group of cells, the mucosa of which was thickened and inflammed but the bone intact, to a disorganized and suppurative mass with the landmarks more or less obliterated. In the uncomplicated cases of purulent ethmoiditis, with polyp formation, the results are inversely proportionate to the extent of the surgical intervention."

In spite of the improved technic of the Sluder and the Mosher operations, the anatomical studies of Onodi, Loeb, Davis and others have shown the impossibility of opening every cell. Too often a fairly well draining ethmoid is transferred by the scar tissue following an incomplete operation into a cess-pool of pent

up infection under greater tension than before the intervention. The results in the past few years have undoubtedly been better than formerly though far from the ideal.

The end results of operations on the sphenoid are on the whole better in the uncomplicated cases than in operations on the other sinuses. All have the same end in view; viz. removal of the anterior wall wholly or in part and the pars ethmoidalis. The removal of the latter is the key to the successful outcome. Although a large opening is made in this anterior wall the opening sometimes shows a marked tendency to close and necessitates enlarging.

Perhaps nowhere else in surgery does the skill and judgment of the operator have a more direct bearing on the end results. Thorough yet conservative surgery must be followed. The operator who does too much and the operator who does too little will find end results disappointing both to himself and the patient. The timid operator with his repeated tinkering and the bold operator who advances at the expense of undiseased tissue, will both come to grief.

Passing from the consideration of the end results in general let us examine the end results themselves more specifically. For convenience they are divided as follows:

1. Relief from all symptoms.
2. Persistance of one or more symptoms.
    - a Suppuration.
    - b Pain.
    - c Other symptoms.
3. New symptoms.
    - a Crusting.
    - b Neuralgia.
    - c Paralysis.
    - d Other symptoms.
4. Complications.
    - a Meningitis.
    - b Orbital Abscess.
    - c Optic Neuritis.
    - d Empysema.
    - e Fistula.
    - f Anosmia.
    - g Epiphora.
    - h Death.

4. Relief From All Symptoms. In order to study this and the other less favorable end results, more intimately, a questionnaire was addressed to all the members of the American Laryngological, Rhinological and Otological Society, which included the following main questions:

A. The approximate percentage of sinus operations followed by complete recovery, by partial recovery, without result; without relief from pain, from suppuration, from other symptoms; by secondary operation and by recurrence after apparent or actual cure.

B. The operations giving the most satisfactory results.

C. Postoperative complications.

D. Fatalities.

The answers to the questionnaire showed that a majority of those reporting claim a higher percentage of complete recovery than might have been supposed. Several asserted that 100 per cent. of their operations had been entirely successful, even upon other than the maxillary sinuses. Quite a large number estimated such results of their operations as above 90 per cent. and very few fell below 50 per cent. It is an interesting fact that in almost every instance in which the percentage of complete recovery was reported below 50, the ethmoid cells were involved.

To call an end result entirely successful, all symptoms existing prior to operation should be relieved without the induction of any new postoperative conditions such as an excessive dryness of the mucous membrane of the nose and throat, obstruction in breathing, crusting nor any of the various neurotic complaints. In fact the patient should be given as nearly a normal, symptomless, functionally perfect nasal and nasopharyngeal organ as praetical.

We have just spoken perhaps more in the terms of the ideal; furthermore, it is not likely that many results will actually attain such a degree of entire success; however, such is the picture of our aims.

Passing to the next degree in successful end results, we come to those which are considered partially successful. Some of the symptoms have been relieved and but one or more symptoms persist, or perhaps some new unpleasant features supervene in the postoperative picture. While this might perhaps be considered the most frequent end result attained, the questionnaire did not show a large percentage of such results.

An operation in which pain and headache are relieved entirely, while suppuration persists, cannot be considered as being entirely successful; there were few answers to the questionnaire which stated that there had been any large percentages of failures in that respect.

Relief from suppuration is probably obtained less frequently than any other of the special end results. However, as pointed out elsewhere in this paper, perhaps this is not such a disastrous failure after all, providing the operation has established drainage, secured relief—or partial relief—from symptoms due to the resulting toxemia, or has brought about a partially successful result; for instance, relief from pain and headache.

The answers to the questionnaire revealed a surprisingly low estimate in general of cases in which there was not relief from suppuration. Very few estimated above 50 per cent. and most gave figures below 25 per cent.

Among the more unwelcome end results frequently obtained but never to be desired may be mentioned: anosmia, diplopia, ostitis and periostitis, permanent epiphora, anesthesia of the face and other regions, etc.

Anosmia is frequently claimed by patients following nasal operations and undoubtedly often occurs, as shown by the answers to the questionnaire. Twenty-four reported 31 definite cases. The grand total must be much larger because a few men reported such indefinite figures as "four or five," "several," etc. Many cases were recorded, however, in which explanatory notes stated they existed only a short time. This is of course easily explained by a temporary postoperative swelling shutting off the olfactory area for a time. However, not a single operator stated clearly that he had had a permanent case which he was sure had not existed prior to operation. Inasmuch as malpractice suits have been filed, based upon that very issue, this fact becomes a very important one.

Double vision is another complication the possibility of which should not be overlooked; in the answers to the questionnaire there were many cases reported. However, there were very few in which the operator stated clearly that they were permanent.

Ostitis and periostitis are very unfortunate complications of frontal sinus operations, and undoubtedly account for many, many failures and permanent fistulae, etc. The replies bring out clearly that this is not an infrequent occurrence.

Anesthesia of the face as a complication following frontal and maxillary sinus operation has to do with a condition that is chiefly

important only as an accident of some inconvenience to the patient but of no great import; otherwise, although it is to be anticipated in nearly all external frontal operations and in many extensive maxillary operations, most cases reported seemed to clear up eventually, even though the nerve involved is usually severed during operation.

Among new symptoms should be mentioned crusting, fistulae, excessive dryness of nose and throat, sensations of obstructed nasal breathing, neurotic symptoms such as sensations of scratching, pin pricks and all the various paresthesias of the throat which a neurasthenic is capable of developing.

If too much tissue be taken away from the nose during an operation, dryness of the nose, postnasal space and throat may result, a very distressing and not infrequent postoperative symptom. Other cases develop a sense of swelling and obstruction in the nose (often not founded upon any real obstructive swelling) but as long as the sensation is there the patient suffers as much.

Fistulae are very unfortunate mutilating and scarifying complications which usually follow an ostitis or periostitis.

The possibility of inducing neurasthenia by repeated nasal operations is deserving of very careful consideration. Such a complication following operations is often trying and hopeless.

There are 53 fatalities reported by those who answered the questionnaire, following sinus operations. The majority of these deaths were either from meningitis or brain abscess but among others were mentioned: general septicemia, pyemia, anuria, tuberculous processes, pulmonary thrombosis, etherization and myocarditis. There were 45 who reported fatalities.

The large number of deaths, assembled by the questionnaire, is impressive evidence that operations upon the accessory nasal sinuses are not to be undertaken lightly; in fact, it signifies that any operator if he does much of this work will sooner or later meet with a fatality. If each operation is regarded with such a possibility always in mind, an attitude will be developed which will greatly increase the respect for such operations and will assist in placing them among the other more dignified and serious operative procedures. However, deaths may occur in spite of and not because of operations and thus the condition frequently calls for the most painstaking diagnostics and prognostics. Many severe preoperative headaches undoubtedly mean localized areas of meningitis which under the influence of the operation may become general with serious or fatal result.

The appended tables constitute a summary of the answers given by 70 members of the Society to the questionnaire sent them.

ANSWERS TO QUESTIONNAIRES.

I.

1. What proportion, approximately, of your sinus operations have been entirely successful in result?

(The table below lists the number of answers received, estimating their percentage of results as shown in the first column.)

	A. Maxillary	B. Frontal	C. Sphenoid	D. Ethmoid
100 %	6	4	3	1
90-99	14	8	4	3
80-89	3	4	5	2
70-79	4	8	5	6
60-69	1	2	2	2
50-59	2	2	7	5
40-41	None	None		2
30-39		1		3
20-29		1	1	None
10-19		1		4
Below 10 %				

Among the answers to the above question were many such as "large percentage," "cannot estimate," "cannot give accurate data," etc. Many did not answer or attempt to estimate.

2. What proportion, approximately, of your sinus operations have been partially successful in result?

(The table below lists the number of answers received, estimating their percentage of results as shown in the first column.)

	A. Maxillary	B. Frontal	C. Sphenoid	D. Ethmoid
100 %	2	None	1	1
90-99	3	4	2	None
80-89	1	2	2	1
70-79	None	None	None	3
60-69	None	None	None	3
50-59	None	3	2	4
40-49	None	None	2	4
30-39	None	None	3	1
20-29	3	5	6	4
10-19	9	5	1	2
1-9	7	4	4	2

3. What proportion, approximately, of your sinus operations have been entirely without result?

(The table below lists the number of answers received, estimating their percentage of results as shown in the first column.)

	A. Maxillary	B. Frontal	C. Sphenoid	D. Ethmoid
None	15	11	8	8
1-5 %	6	4	3	1
6-10		5	5	5
11-20	3	1	4	4
21-30		1		2
31-40				1
41-50				1

4. What proportion, approximately, of your sinus operations have not been followed by relief from pain or headache?

(The table below lists the number of answers received, estimating their percentage of results as shown in the first column.)

	A. Maxillary	B. Frontal	C. Sphenoid	D. Ethmoid
None	17	9	6	6
1-5 %	9	10	6	5
6-10	1	1		3
11-20				2

5. What proportion, approximately, of your sinus operations have not been followed by relief from suppuration?

(The table below lists the number of answers received, estimating their percentage of results as shown in the first column.)

	A. Maxillary	B. Frontal	C. Sphenoid	D. Ethmoid
None	8	5		
1-5 %	7	4	2	3
6-10	5	4	4	3
11-20		4	3	2
21-30	2	4		5
31-50	1	3	4	7
51-75	1			4
76-90				3
91-100	1	1	1	1

6. What proportion, approximately, of your sinus operations have not been followed by relief from other symptoms?

(The table below lists the number of answers received, estimating their percentage of results as shown in the first column.)

	A. Maxillary	B. Frontal	C. Sphenoid	D. Ethmoid
None	12	5	5	4
1-10 % Inc.	4	3	4	3
11-25 Inc.		3	3	4

None gave over 25 %.

7. What proportion, approximately, of your sinus operations have been followed by secondary operations?

(The table below lists the number of answers received, estimating their percentage of results as shown in the first column.)

	A. Maxillary	B. Frontal	C. Sphenoid	D. Ethmoid
None	8	4	3	2
1-5 % Inc.	10	10	3	2
6-15 Inc.	8	10	7	10
16-25 Inc.	2	2		5
25-50 Inc.	2	2	5	7
50-75				4
Above 75%			1 gives 100%	1 gives 100% 1 gives 75%

8. What proportion, approximately, of your sinus operations have been followed by recurrence after apparent or actual cure?

(The table below lists the number of answers received, estimating their percentage of results as shown in the first column.)

	A. Maxillary	B. Frontal	C. Sphenoid	D. Ethmoid
None	9	8	5	5
1-5 % Inc.	11	8	4	4
6-10 Inc.	1	2	2	3
11-25 Inc.	3	4	4	3
26-50 Inc.	2	1	1	3
51-75				1
Above 75%				1 case 80%

II.

What operations have given you the most satisfactory results?

1. IN MAXILLARY SINUSITIS.

a Large opening (of some sort) under inferior turbinate (Krause Mikulicz). Preferred by..... 15
Given equal preference with other operations..... 13
b Caldwell-Luc: Preferred by..... 10
Given equal preference with other operations..... 13
c Denker: Mentioned as formerly done, now abandoned by..... 1
Preferred by..... 4
Given equal preference with other operations..... 7
d Puncture and douche with pressure: Preferred by..... 1
Given equal preference with other operations..... 1
e Canfield: Preferred by..... 1
f Free opening under middle turbinate: Preferred by..... 1
Given equal preference with other operations..... 1
g W. H. Theobold technic: Preferred by..... 1
h Skillern: Preferred by..... 1
Given equal preference with other operations..... 2

2. IN FRONTAL SINUSITIS.

a Killian: Preferred by 8
Given equal preference with other operations..... 8
b Intra-nasal (Technic not described) Preferred by..... 6
Given equal preference with other operations..... 12
c Mosher: Preferred by 3
Given equal preference with other operations..... 7

d	Lothrop: Preferred by	6
	Given equal preference with other operations	5
e	Modified Coakley: Preferred by	1
f	Ogston-Luc: Preferred by	1
g	Enlarging opening by Rass (Thompson & Sullivan) Mentioned by	2
h	Ingals: Preferred by	1
	Given equal preference with other operations	1

3. IN SPHENOID SINUSITIS.

a	Enlarging natural opening: Preferred by	11
	Given equal preference with other operations	1
b	Hajek: Preferred by	4
	Given equal preference with other operations	1
c	Through ethmoid: Preferred by	3
d	Removal of front wall to floor: Preferred by	10
e	Faraci: Given equal preference with other operations	1
f	Enlarge opening and curettage: Preferred by	1
g	Mosher: Preferred by	2
	Given equal preference with other operations	1
h	Andrews: Given equal preference with other operations	1
i	Sluder: Preferred by	2
	Given equal preference with other operations	2
j	Converting both sphenoids into one by removing septum between	1
k	Drill & Cruette: Preferred by	1

4. IN ETHMOIDITIS.

a	Removal of middle turbinate and curettage: Preferred by	4
b	Mosher: Preferred by	15
	Given equal preference with other operations	7
c	Removal middle turbinate and forceps: Preferred by	2
d	Hajek: Preferred by	1
e	Ballinger: Preferred by	1
	Given equal preference with other operations	1
f	Exenteration followed by saturated solution scarlet red tincture Benzoin: Preferred by	1
g	Forceps and Curette combined after removal: Preferred by	3
h	Halle: Given equal preference with other operations	1
i	Resection endonasal (method not stated): Preferred by	3
j	Sluder-Gruenwald combined: Preferred by	1
k	Sluder: Preferred by	1
	Given equal preference with other operations	1
l	Exenteration: (Method not stated.) Preferred by	4
m	Middle Turbinectomy: Preferred by	1
n	Pratt: Given equal preference with other operations	1
o	Opening anterior ethmoid cells and later removing middle turbinate if necessary: Preferred by	1
p	Doing as little as possible consistent with finding the diseased cells, which I have not always found to be possible, (stated identically almost) by	3

q Two-stage: Removal middle turbinate, local treatment and suction; later exenteration if necessary: Preferred by..... 2

5. IN PANSINUSITIS.

a Intranasal route (method not stated). Preferred by..... 3
b No formal operation 1
c No operation 1
d Combination (nothing more definite stated..... 5
(1 adds: Autogenous vaccines.)
e Combination as indicated by existing condition..... 2
f Lynch operation: Preferred by..... 1
g Radical Killian: Preferred by..... 4
h Operates each sinus separately; does not state separate operations 7
i General opening 1
j Entranasal route 1
k Killian-Denker: Preferred by..... 2
l Combination external frontal and intranasal for other sinuses.. 1
m According to circumstances, or Killian..... 1
n Operate through eyebrow for frontal and through nose for ethmoid cells and maxillary..... 1
o Separate in following order: Mosher's (ethmoid); Hajek's (sphenoid); Lothrop's (frontal); Caldwell-Luc, or simple resection nasoantral wall.....
p First submucuous resection to give room, then exenteration ethmoids and widening sphenoid opening, no interference frontonasal duct 1

III.

Please state the number of cases of the following postoperative complications observed by you.

1. Anosmia following ethmoid operations:

Cases reported by 24. Six answer, "None which did not exist prior to operation."

Thirty-one definite cases reported but no one states positively that he had a permanent case.

Several cases reported have footnote appended that "They eventually cleared up."

Several reported as follows: "Several cases;" "A few cases" and similar answers, without giving the exact number, so that the 31 cases are swelled by an indefinitely large number.

2. Double vision:

Twenty-six cases reported by 18 observers.

Many reported as follows: "Several cases;" "Occasional temporary;" "Occasionally;" "None permanent;" "4-5 of all cases," and similar answers, thus swelling the total perhaps enormously.

3. Ostitis and periostitis following frontal sinus operation:

Twelve cases reported by 12.

Some reported "Several cases," which therefore swells the total indefinitely.

4. Permanent epiphora following maxillary sinus operation:
   Cases reported by 6 only, but 7 reported.
5. Anesthesia of the face following maxillary and frontal sinus operations:
   One hundred and twenty-four definite cases (1 man reporting 100) by 26 men.
   Many reported cases but were indefinite as to the exact numbers, with such answers as "None permanently" (from which some must be assumed as being temporary); "Usually after external frontal operations;" "Nearly all cases have for some months." Several reported, "None longer than 3 months."

IV.

Please state the number and causes of fatalities following sinus operations:

1. MAXILLARY.

Deaths reported by 3, totalled 3.
One case careless etherization.
One case sepsis and severe myocarditis died on table.
One case bleeder pulmonary thrombosis.

2. FRONTAL.

Deaths reported by 22, totalled 23 plus, as three or four answered "several" or "two or three" and such indefinite replies. Some did not give causes of deaths.
There were 11 deaths of meningitis.
There were 3 deaths of general septicemia.
There was 1 death of ether.
There was 1 death of pulmonary thrombosis.
There were 4 deaths of frontal abscess.
There were 3 deaths of ruptured brain abscess.
There was 1 death of anuria.
There was 1 death of necrosis of skull (which the operator thinks probably tuberculous).
There was 1 death of lepto-meningitis.
There was 1 death of brain abscess and lepto-meningitis.

3. SPHENOID.

Three reported deaths:
Two from meningitis.
One from tuberculosis and doctor thinks entire process may have been due to tuberculosis originally.

4. ETHMOID.

Fourteen reported deaths, altogether 18 cases:
Twelve were from meningitis.
One case aborted and died of sepsis following abortion (operation as factor doubtful).
One case died of tubercular meningitis.
One case died of asthma.

5. PANSINUSITIS.

Deaths reported by 5, totalled 6:

One death was from uremia.

One death was from tuberculous abscess.

One death was from frontal lobe abscess.

One death was from meningitis.

One case, a young girl, (cause of death not reported).

One case, cause not reported.

DISCUSSION.

Dr. John E. Brown, Columbus, Ohio: I have had only two deaths following operations on nasal accessory cavities, both of these in frontal sinus cases. In one of these death promptly followed an operation in a case where advanced meningitis was already evidenced as a result of what I conceive to have been an infection which followed a rather severe traumatism. This infection was manifested by the differential blood count, by the general clinical symptoms, by the eye symptoms; and the course of the case was not at all influenced by operation in which we found stagnant pus filling the frontal sinus and in which a lumbar puncture at the same time showed a streptococcic meningitis.

The other case was a general intranasal involvement followed by frontal sinusitis, in which no discrete pus was found. The blood and the clinical symptoms evidenced the beginning of meningitis in this case and I have sometimes thought that the patient would perhaps have had slightly greater chances for recovery if I had done a smaller operation, because, not finding pus in the frontal sinus, I opened the ethmoidal sinuses also. In this case the course of the disease was not changed by operation.

Dr. L. W. Dean, Iowa City, Iowa: The reader of the paper stated in answer to the questionnaire which was sent out to the members of this society, that good end results were reported as having been secured in from 50 to 100 per cent. of cases. I am conversant with the work of one of the members of this society who has reported 100 per cent. of cures. I have told this man that I had in my service in Iowa City a number of cases of suppuration in the nasal sinuses which I could not cure. He was surprised to have me make such a statement, and I have been thinking somewhat about the reason for this difference in the end results. This man has never seen a case of paranasal sinus disease in a child, and he has never had a case of orbital cellulitis in a child, and he has had in his service more cases of orbital cellulitis than we have in Iowa City. This man lives in a high, dry climate and in my judgment the differences in his end results and in my end results are due to climatic differences. This gentleman does not see in the members of his community the cases of chronic suppurative sinus disease with osteomyelitis that I do. The differences in his results, however, are not wholly due to a difference in pathology because my patients who are wealthy and who seek the climate in which this man lives, secure benefits which I can not get for them in Iowa. In my judgment one of the essential things determining the prognosis of paranasal sinus disease is whether or no the patient is able to seek a proper climate. Paranasal sinus disease is certainly a very different thing in the moist, cold climate of Iowa from that which they have in the high, dry climate of Tucson, Arizona or Asheville, North Carolina.

Dr. Perry Goldsmith, Toronto, Canada: I believe ventilation is the proper treatment of sinus disease. If you open up a cavity that nature never intended to have a large inlet or outlet, the mucous membrane will resent it. It so happened that I was away from my practice for five years, and did not know I was going until the day before I left. At

that time I had many cases which I had been treating for years, and others on whom only a preliminary operation had been performed primary to doing some larger operation. On my return I was greatly surprised to find that those on whom I had done the least had received the most benefit, which makes me think that often we do not wait long enough after a preliminary operation. Take, for instance, the sphenoid, we do not curette it with the amount of freedom that we do the antrum; we curette it a little and ventilate it thoroughly. My belief is that the antrum should not be curetted any more than can be accomplished by firm wiping off with gauze. If you caret too much you take away all the mucous membrane which is replaced by granulation tissue and this continues to secrete and form crusts. In antrum cases where you think you have not been sufficiently thorough to clear the antrum up, you are often amazed at the good results that follow.

Dr. Charles C. Jones, Cincinnati, O.: My experience has been that after you do an ethmoid operation, you may be as radical as you can with an internal ethmoid, they will still have their acute exacerbations and they will come back.

I have had two cases of meningitis. One case had symptoms of developing meningitis at the time of operation, increased pressure of the spinal fluid, and the day following developed well-marked meningitis. Of course, that was not because of, but in spite of the operation. In another case with chronic discharge from the nose, I operated and in the course of three or four days the patient developed a meningitis. I have always felt that if the patient had been left alone she would still have her chronic sinusitis.

My end results are very good. I do not get cures in many cases; I often get relief from the symptoms, but they usually come back complaining of more or less postnasal discharge and I think our end results would be better if we confined ourselves more closely in our diagnosis, watched our cases longer and operated much less frequently.

Dr. George F. Keiper, Lafayette, Indiana: I have had one death after an external frontal sinus operation. The patient was badly infected by the accumulation in the frontal sinus, so thoroughly, that death was bound to occur any way, but the patient died after getting a very thorough drainage into the nose.

Frontal sinus infection I have found, as a rule, will yield very readily to operation, but we should never perform an operation without first having secured a thorough opening of the fronto-nasal duct. Some do not have any pus in them at all. Sluder has called attention to the vacuum headache from which some people suffer. The cure of these headaches is getting ventilation up there. In the ethmoidal cells, I am satisfied that I have done a good deal of damage in opening normal ethmoid cells and curetting into them a lot of pus that would not have been in them otherwise.

Dr. Charles S. Means, Columbus, Ohio: I think the patient to be pitied is the one who has had turbinals, cells and sinuses removed or opened from his nasal cavity.

I feel that I have been ultra-conservative all of my life and while I have not relieved all of my patients and have not obtained the results I desired at all times, still when I see these patients that have had all the cells curetted or totally exenterated, I feel that my results are as good as those who have done in my estimation too much.

I have had two deaths. One case I operated on for frontal sinus infection, (Killian) and got a good result as I thought, but two or three months afterwards I had to repeat the operation. The sinus had filled with granulation tissue and the patient died two or three weeks afterwards from meningitis. The second was operated both intranasally and externally and died four months later from meningitis.

In my antrum cases I have had practically universal relief, but some recurrences as everyone else has.

I have always tried to be conservative because, as Dr. Goldsmith has said, "We will never get normal mucous membrane again and when we have no normal mucous membrane on the cell walls, we will not have a normal patient."

Dr. Gordon B. New, Rochester, Minn.: I take it for granted that the discussion of the subject of nasal sinus disease includes the malignant conditions as well, and I thought it might be interesting to make a further report on the group of malignant tumors of the antrum that I reported in this section at Cincinnati a year ago. At that time eighteen cases of malignant tumors of the antra were reported in which the cautery and radium had been used; of this group there were ten cases that had not had recurrences at that time. Now, a year later, we have still nine cases that are well over a period from twenty to forty months. I wish to impress the fact that these cases are not reported as cured, but I believe that the end result in these malignant cases will depend upon the intensive study of heat along with radium.

Dr. E. T. Sensency, St. Louis, Mo.: I have undertaken on several occasions on the cadaver to remove intranasally the ethmoidal cells. This procedure was uncomplicated by fear of breaking through into the orbit or cranial cavity and unhampered by bleeding, condition of the patient or the like. Upon sawing the skulls apart afterwards to view the operative field one was impressed in many cases by the inadequacy of operations of various types. Cells were often just broken into or left untouched—meaning in the living patient a further continuance or spreading of the infection.

I was very much impressed by Dr. Skillern's article advocating the primary removal of the middle turbinate, and then a period of watchful waiting, and attack only upon the infected field. This method will apply to all cases except those in which an imperative and immediate exenteration is indicated on account of some complication such as optic neuritis, choroiditis, or the like, where we cannot wait for this slow method of localization.

A complete cure, I take it, means a complete cessation of discharge, complete and constant relief from pain, and subjectively at least, a return of normal nasal function. I believe that the percentage of such cures in old chronic suppurative ethmoiditis is very much lower than 100 per cent. It would be interesting, but at times humiliating, to take a series of one hundred cases, and carefully observe them over a period of years and then revise our statistics.

Dr. Norval Pierce, Chicago, Ill.: Speaking broadly, I should say that the less operating on the nose, the better. In speaking of end results we will have to take up those cases that are really "end" results—that is, end fatally. In our own city I know of approximately ten cases that have been real end results, and all of these were operations on the middle turbinate body with acute involvement of the anterior ethmoid cells and frontal sinus. Therefore I have in my own mind formulated this axiom—that none of these cases should be operated upon in the first attack unless the orbit or the cranial cavity is threatened with involvement, and for the last five years I have seen no reason for varying that axiom, as with local treatment, cocain, adrenalin, to shrink up the middle meatus at certain times during the day these patients have kept themselves sufficiently free from pain and in the course of a week they recover. The operative danger is diminished in cases where the attacks are repeated at rather frequent intervals. Probably Nature has sealed up the perivascular spaces to some extent and thus impeded the course of invasion to the cranial cavity. All the cases of "end results" I have mentioned died of septic menin-

gitis and therefore it is probable that in these cases the pathways to the meninges are opened up for septic invasion by the operative trauma.

In frontal sinus disease the end results are favorable most frequently in those cases that are operated upon externally. That means that operations on the frontal sinus are not indicated where the disease is not threatening the orbit or the brain cavity, and where the attacks are not frequent or long continued. When the orbit or cranial cavity is not menaced and the occurrence of discharge and pain is frequent or continuous we may operate intranasally by taking away the anterior ethmoid cells and doing the intranasal operation. These cases almost always have recurrences more or less frequently. That is, the cases operated intranasally are the ones that disappoint us most frequently by the end results. On the other hand, those cases that are giving the most distress, indicating osteomyelitis either of the orbital plate or the external plate, the ones indicating operation most, if operated on externally will give the best and most satisfactory results.

The ethmoid labyrinth is the crux of the whole matter. These cases, as you have probably said, are the ones that are the most disappointing, and I must say that at the present time I am not always clear in my own mind as to which cases should and should not be operated on. Surely some of the cases that I have operated upon are worse after operation than before.

I believe it is a great mistake to tear out the entire ethmoid labyrinth, or even the anterior and posterior cells in all cases where we observe polypi and pus coming from the ethmoid cavity. I think future development lies in differentiating diseased conditions of the various cells composing these two series, the posterior and anterior series, and operating on those individual cells. It may seem an iconoclastic view if I say that I am inclined to think that we can get as good results by the local application of trichloracetic acid in many of these cases as we can from operative procedure, and this is especially true in these cases of so-called hyperplastic ethmoiditis.

Dr. Charles Robertson, Chicago, Ill.: I wish to add my testimony to that of the gentlemen who have testified against the removal of the middle turbinate body. Dr. Skillern in his conservatism accepts a radical view to start on. He accepts the idea that Mosher was entirely right to clear away the field so that we can commence to observe the case. I have for several years past kept the turbinate intact.

In ethmoiditis we have a suppuration coming from somewhere. We do not know which cell is involved, but we know there is some inflammation of the anterior or posterior group. In nearly all these cases it is the anterior cell that is attacked and it is my custom to clean out the ethmoid cells as high as the cribriform plate. Mosher breaks through the turbinate and removes turbinate and cells "en masse". In my operation I open the cells and leave the turbinate in position. I have done this repeatedly and have never yet regretted having done it as the results are good. Locally I apply a solution of 25% ichthyol and glycerine from time to time and even polypi frequently disappear. Polypi do not mean very much in themselves as polypi are but symptoms, but in these people with suppuration of cells that you can't locate, where the drainage is fairly good, you would do well to try this treatment.

Dr. George E. Shambaugh, Chicago, Ill.: When one speaks of end results of sinus operations one must bear in mind what one is justified in expecting from such operations. There are a good many rather indefinite nose and throat symptoms which may or may not have anything to do with sinus trouble, such as nasal obstruction, postnasal catarrh, etc. These are not likely to be influenced in any way by operations on the sinuses, even when the sinus trouble is entirely cured by an

operation. Where the indication for an operation is the presence of pain, we can expect the end results to be good, because by securing proper drainage this troublesome symptom disappears, even though the discharge may not cease entirely. I feel that there is a good deal of confusion about the relation of the sinus disease to headache. Where a chronic disease of the sinuses is causing headache there is, as a rule, no special difficulty in diagnosing such presence of sinus disease for the reason that empyema is usually the condition. I do not recognize cases of headache due to sinus disease where there is an absence of fluid in the sinuses, the so-called vacuum headache, any more than I see headache caused by nasal spurs. Where we have followed the proper indications for surgical interference the end results of operations for chronic sinus disease is usually satisfactory. I have found that the intranasal method of operating gives just as satisfactory results as an external operation. I see a good many cases where trifacial neuralgia is attributed to some sinus infection which may or may not be there. Usually the sinus disease has nothing to do with trifacial neuralgia and a good deal of unnecessary, radical operating is done without any benefit as far as the neuralgia is concerned.

Dr. W. B. Chamberlain, Cleveland, Ohio: I wish to say just a word. Dr. Sauer spoke of the X-ray examination. No one can doubt the value of the X-ray in showing us the size of the sinus, but when Dr. Sauer says it gives us an excellent idea of the pathology in the sinus, I wish to disagree with him. In a recent case with a temperature of 102.5° F., and evidence of frontal sinusitis, the X-ray plate was negative. Operation, however, showed the sinus to be filled with a quantity of very foul pus. The patient "went out" with meningitis. I was interested in obtaining an autopsy to see if my operation had anything to do with the meningitis and was gratified to find that I had not encroached on the cranial cavity, as I feared I might have done.

I do not know whether conservatism is an admission of premature senility or not. If so, I am willing to stand by the charge, but when we go on and do these extensive, deforming operations in the nose I think we want the condition pretty well outlined beforehand. I cannot help thinking of the statement of Hajk who said if we made a diagnosis of a sinus condition in three weeks we were doing well. I think too many of us try to make a diagnosis on the occasion of the first visit. I cannot help thinking of those cases in the Vienna clinic, where everything in the nose was removed, and the patients suffered with crust formation, atrophy and everything else and the last stages of the cases were worse than the first.

Dr. B. N. Colver, Battle Creek, Mich.: The middle turbinate is an ethmoid cell containing turbinate tissue. The cell finds its way down into the turbinate. The cystic turbinate is shaped something like a gourd. In these cases I think if you do a submucous resection it is impossible for the septum to spring over unless something is done to reduce that turbinate. I have entered the anterior end of the cystic turbinate by a quick plunge of the septal knife which makes a little opening in the side of the middle turbinate. Then with a pair of scissors the incision is continued along the middle border and up over the upper portion. Then put on a snare and the turbinate is reduced not only to one-half but one-third its size, so we have a minimum amount of traumatism. The inside is covered with mucous membrane, not the same as the outside, but I think it adapts itself to the air which passes behind the turbinate. Then a flat forceps can be placed on the remaining part of the turbinate which corrects the little curvature that is left and places the middle turbinate where it can assume the position which the air current indicates later on. I have had cases that were not normal, where there was a thin shell of bone covered by mucous membrane and in those cases I have tried to enter the cell without

success. The knife would be deflected and I could not get an entrance. In those cases I have obtained some relief by straightening the turbinate, which causes some reduction of the cell. I think that gives us an eighth of an inch sometimes, which is very well worth while. I then take off all visible obstruction by removal of the uncinate process and removing the anterior wall of the bulla cell. The minimum amount of surgery and the maximum amount of time sometimes gives us the best results.

Dr. H. W. Lyman, St. Louis, Mo.: In cases of meningitis, infection is not necessarily caused by the penetration of an instrument into the cranial cavity. I saw an autopsy recently in a case in which there was thrombosis of the longitudinal sinus and tributary veins, and an abscess in the upper part of the right Rolandic area. There had been an operation of the ethmoid cells, but no injury of the roof of the ethmoid labyrinth could be discovered. In another case of meningitis the avenue of infection was found at autopsy to be through a dehiscence in the posterior wall of a large frontal sinus, which had not been operated on. I think that very seldom is there an actual introduction of an instrument into the cranial cavity.

Dr. Joseph C. Beck, Chicago, Ill.: We all like to hear the past experience even of those that disagree. I wish I had time to discuss some of the paper, but that is the penalty of being Chairman—he is not supposed to do that.

However, there is one point that has not been touched on that I consider important in speaking of the bad end results and that is that we do not pay enough attention to the study of what we remove, and that is why some cases do not go on to termination as they should. If we studied the spicules of bone and other things that we remove as we should, we could easily tell why these cases did not get on better. Many of you have spoken of the osteitis in some of these cases, and if you notice the condition of the tissue that is removed and pay more attention to the study of the postmortem changes, you will find that they are the great phase of the failures.

THE TONSIL QUESTION TO DATE*.

By GEORGE F. KEIPER, M. D., Lafayette, Ind.

Embryology: The palatal arches appear at the third month of fetal life, thus forming the sinus tonsillaris. The plica tonsillaris is formed by a flattening of the tonsillar tubercle, while the intra tonsillar fold appears at the same time and divides the fossa into a superior and inferior one. At the end of the fourth month the crypts appear from sprouts which spring from the mucosa, while the lymphoid tissue begins to develop late in embryonal life at the seventh to eighth month.

Anatomy: The tonsil may be described as a mass of lymphoid tissue placed on the sinus tonsillaris and loosely attached to the surrounding structures. The palatoglossus and palatopharyngeus muscles form respectively the anterior and posterior pillars, with their mucous membrane coverings. The capsule is merely a portion of the intrapharyngeal fascia, or aponeurosis, having its upper attachment at the base of the skull and extending downward into the region of the esophagus. The tonsil is covered anteriorly with mucous membrane and elsewhere with the capsule, with which it is continuous. The blood supply is from the pharyngeal branch of the external carotid, the tonsillar and the facial. The dorsalis linguae goes to the anterior pillar and the upper segment. The larger veins empty into the pharyngeal plexus, together with the veins from the epiglottis and the base of the tongue. The lymphatics from the tonsil pierce the buccopharyngeal fascia and superior constrictor muscle and pass between the stylohyoid and internal jugular vein to the upper deep cervical glands and end in a gland which lies on the posterior belly of the digastric and internal jugular vein. These glands receive efferent vessels from the internal maxillary and submaxillary lymphatic glands, from the lymphatic vessels of the cranial cavity, the deep muscles of the upper neck, posterior part of the tongue, middle of the pharynx, upper larynx and upper thyroid, ending ultimately in the right lymphatic duct and the thoracic duct. In severe cases of Vincent's angina it is sometimes possible to trace out these efferent vessels way down the neck and to demonstrate from such an involvement

*Abstract of Paper. The full text appears in the Laryngoscope, Vol. XXXI, No. X, 1921.

dyspnea hoarseness and laryngeal paralysis. Histologically the tonsil appears to be a mass of lymphoid tissue supported by a frame work of fibrous tissue, the capsule, into which muscle fibres from the superior pharyngeus penetrate to a certain extent. This tissue contains many crypts which are usually branched and may contain pockets. The pockets often contain broken-down and effete material which, unable to escape, may break down into pus and be absorbed into the general system. The epithelium lining the crypt is of the same flat corneus type as that covering the tonsil. When the tonsil degenerates it is because of the development of fibrous tissue therein, which chokes out the lymphoid tissue, and the atrophy which follows results in the small, hard fibrous tonsil.

Physiology: This is still undetermined. Wright thinks tonsils removed in infancy are liable to recur as does a lobster's claw which will regenerate when removed. He also states that they lose their function and become pathological structures at the age of from four to six. Kenyon and Kradwell regard the function of the tonsil as physico-mechanical providing a channel for the action of the palatoglossus and affording support and protection to the palatopharyngeus.

Pathology: The tonsil is subject to all of the usual inflammatory and suppurative diseases, acute and chronic, as well as the usual neoplasms. The difference between the normal and the diseased tonsil is in the amount of fibrous tissue present in the tonsillar tissue. So marked may be the contraction from the presence of this fibroid tissue that surgeons have made errors in diagnosis and have taken the small hard tonsils to be a papilloma of the tonsil. This fibrous tissue may further degenerate into granular or hyaloid tissue around which may cluster collections of epitheloid and atypical giant cells.

Bacteriology: From tonsils have been recovered streptococcus hemolyticus, viridans and mucosus; pneumococcus, various types; staphylococcus, various types; the spirillum of Vincent-Plaut; the fusiform bacillus of Miller; the Friedlander bacillus; the Klebs Loeffler bacillus; the bacillus of influenza; the tubercle bacillus and the Ray fungus of actinomycosis.

Etiology of Tonsil Disease: The narrow jaw of civilized man is an etiological factor as are the recurrent coryzas of children as well as the infective and inflammatory diseases. Diagnosis is made frequently by inspection, but the help of the laboratory may be required and cultures should be made whenever there is the slightest

doubt. The information given by the finger as well as the mirror is always to be obtained in doubtful cases.

Remote Effects: The tonsil is responsible for many remote effects both by direct continuity of the inflammation as to the ear through the Eustachian tube or by pressure upon this tube, as in quinsy and severe tonsillitis; to pain on swallowing from the same cause as well; reflexes due to hypertrophy and inflammation and having the seat of the pain in the nose, teeth, gums, hard palate, antrum of Highmore, spheno'd, ethmoid, orbit, pharynx, larynx, trachea and in the ear, as the phenomena of tinnitus.

Relation of the Diseased Tonsil to General and Local Infection: In the last twelve years the operation of tonsillectomy has replaced the older one of tonsillotomy. Many conscientious observers have recorded the results of their work and a vast literature has accumulated. We are now able to trace out the possible connection between diseased tonsils and certain conditions which are found to be cured or markedly ameliorated by complete tonsil extirpation. Sufficient literature has not yet accumulated to warrant our drawing any hard and fast conclusions as to the relationship which chronically diseased tonsils bear to general systemic infection. There have been published within a few years 1439 articles on the tonsil, the great bulk of which relate to operative procedures and their post-operative effects or immediate consequences like hemorrhage or other complications. Only 212 deal with the relationship of the diseased tonsil to toxic infection, or about 15 per cent. of the whole. According to the literature tonsils have been responsible for the following conditions which I have endeavored to group and classify:

1. Genitourinary group, including acute nephritis, pyelocystitis, albuminuria, paranephritis, acetonuria following quinsy, orchitis, hematuria, with and without albuminuria.

2. Arthritic group, including all the infections of the joints.

3. Rheumatic group, including neuralgia, lumbago, perineuritis, myositis, tendosynovitis, sternomyelitis, indurative headache.

4. Cardiovascular group, including acute myocarditis, endocarditis, phlebitis, acute leukemia, anemia.

5. Eye group, including iritis, focal choroiditis, optic neuritis, hemorrhagic retinitis, paralysis of accommodation.

6. Ear group, including suppurative and non-suppurative otitis media, otosclerosis, mastoiditis, Gradenigo's syndrome, disturbances of equilibrium, ear ache.

7. Pulmonary group, including tuberculosis, asthma, secondary pleurisy, bronchopneumonia.

8. Gastrointestinal group, including gastric fever, ulcer of the stomach, appendicitis, recurrent vomiting, jaundice, pyorrhea alveolaris.

9. Glandular group including splenic infarction secondary to phlegmonous tonsillitis cervical adenitis of the tubercular type with abscess formation, parotitis, goiter.

10. Infectious disease group including influenza, scarlet fever, diphtheria, measles, poliomyelitis.

11. Nervous disease group including chorea, hemiplegia, meningitis, vertigo, recurrent encephalitis and meningitis.

12. Septic group including septicemia, severe sepsis, general infection.

13. Miscellaneous group including many skin lesions, bad breath, syphilis, increased temperature, febriculæ without other symptoms, bad dental arches, voice disturbances, aprosexia. This is quite a formidable array of symptoms for which tonsils have been removed. On the other hand the removal of them have been charged as the cause of the following group of sequellae: Basedow's disease, pains in the stomach, speech disturbance, acute myocarditis, endocarditis, suppurative joint trouble, abscess of the lung, hyperplasia of the peritonsillar gland, injury to the singing voice, acute articular rheumatism, foreign bodies in the lung (teeth), facial paralysis, mastoiditis, death from general septicemia.

Abscess of the lung as a complication or result of tonsillectomy merits serious consideration. According to Cutler and Hunt in the July 1920 number of the Archives of Surgery, one patient out of 30 to 50 operated upon develops lung complications, and one in every 150 to 185 dies from such complication. They believe that pneumonia, pleurisy bronchitis, empyema, lung abscess or fatal pulmonary embolism may occur and that pre-existing tuberculosis may show exacerbation. These authors believe the cause to be due to embolism from the operative field, while Whipple is of the opinion that inhalation anesthesia on top of a pre-existing lung lesion may, in some cases, be a factor. According to Hedblom, the symptoms may not show for a period of months or years. Burgen believes that blood-borne infections are quite common, and advises more care in preparations for operations and that the patient should remain in bed for several days following the operation. He advises local anesthesia for older children and adults, and in young children great care in the general anesthesia. Every care

and precaution must be taken against inspiration of foreign material into the lungs.

I have had one case of lung abscess following tonsillectomy; one case of infection of the right knee, and have lost one case from diathesis hemorrhagica after tonsil removal. Deaths have been reported by various authors, and there are many reports of secondary hemorrhage after operation. If the coagulation time were taken in every case these latter would be less likely to occur. The last report of the New York Post Graduate Medical School shows four deaths in three years in connection with tonsil work. Not a great many perhaps, but even one death is an awful experience for a surgeon to endure.

Results of Operation: Layman has reported out of a total of 891 operated upon for various reasons, as arthritis, renal trouble, rheumatism, chorea and surgical adenitis, 566 real cures, 289 with improvement, and 36 with negative results.

The tonsils are not the only source of infection, and before tonsillectomy is performed for this purpose the teeth, the accessory sinuses, the gall bladder, the gastrointestinal tract, the bronchial glands, the lymph nodes, the lungs for tuberculosis, and the eyes should be investigated; nor should we operate in acute infections, luetic processes, advanced tuberculosis, advanced cardiovascular changes, diabetes mellitus, delayed coagulation, high blood pressure or in the presence of fever, for the latter may usher in measles, scarlet fever or diphtheria.

Acute Follicular Tonsillitis. For this ammon tr. guiac locally with a calomel purge one half grain with three grains quinine every three hours until the bowels move thoroughly or until six doses have been given, followed by a saline purge if needed. A simple gargle in a teacup of water of a teaspoon of baking soda is extremely soothing. Have the water hot as the back of the hand will stand and use the whole teacupful, repeating every hour. If the throat be septic, inject antistreptococcic serum and prepare as an adjunct an autogenous vaccine from the contents of one of the crypts.

For Vincent's Angina: Curet the surface clean and then rub in a 30 per cent. solution of nitrate of silver.

Operative Methods: The roentgen ray has been recently recommended as a remedy to cause atrophy and should be tried in cases of hemophilia and status lymphaticus needing tonsillectomy. As to surgical methods, I have no single method, preferring as a rule the snare method of Beck and the tonsillectome method of Sluder.

For Every Tonsillectomy, the patient should be in the hospital the day before; the urine is examined and the temperature and coagulation time of the blood determined. The bowels should be thoroughly opened. The tonsil operation should be as bloodless as possible. Too often these little folks leave our hospitals looking like little corpses from excessive loss of blood at the time of operation. Some operation eliminating dissection ought to be employed and then all bleeding points should be clamped and tied just as does the general surgeon on making an operation.

DISCUSSION.

Perry Goldsmith, Toronto, Canada. I suggest also the value of palpation. If you are going to remove a gland anywhere in the body you palpate it. I make a practice of doing this all the time. If you find a gland that is hard, or one that is painful, it may help you very much. Patients will come in and say "I want to have my tonsils out." "Why?" "Because there are white spots on them." Why not educate the public to the fact that those white spots are frequently present during the day and are not an indication for removal of the tonsil? I have had some cases referred from the surgical and medical side and house surgeons would automatically class them for removal of the tonsils simply because there were tonsils present. I said "Why?" "Well," says he, "that is being done now." It is a fashion I think sometimes overdone. One should be able to write down why the tonsil should not be left and if you cannot write down why they should not be left alone, you should not operate. There are cases in which the operative removal of the tonsil is not wise, where it is due to some personal reason of the patient himself, because he objects to any operation, or when his physical condition counter indicates surgery by a cutting operation. MacKenzie used to apply a paste to the tonsil and the tonsil became fibrosed and gradually disappeared. Dr. Irwin Moore presented a paper in 1919 under the title "Removal of the Tonsil without Surgery" The paste is composed of equal parts of caustic soda and hydrate of lime and to this Mackenzie gave the name of "London Paste," and I will read a brief extract from this article: "Soda cum calce (London paste) is analogous to the Vienna paste, but possesses many advantages over the caustic. It was first introduced in 1864 by Morell Mackenzie after his attention had been drawn to Fournie's work with the Vienna paste, and he employed it with very great success in a large number of cases. It consists of equal parts of caustic soda and hydrated lime mixed with a little alcohol. To this compound Morell Mackenzie gave the name of London paste.

"In this mixture we possess a most valuable therapeutic agent, for it possesses many advantages over the potash salt:

"1. It causes no inflammatory reaction.

"2. It penetrates rather than spreads circumferentially, therefore its application is more localized and the surrounding parts are not affected.

"3. Its action is less severe and continues for a much longer time.

"4. It causes much less pain—this, however, need not be considered nowadays since the introduction of cocaine.

"5. There is no hemorrhage.

"6. There is no rise of temperature, no risks of sepsis, and no bad symptoms ever followed its use.

"7. It may be employed in very young children." I read this to you not with the idea of advocating an application like this except in the minute proportion of cases, but it offers one avenue by which your surgical zeal may be cooled a little.

Dr. John E. Brown, Columbus, Ohio: If you take a group of ordinary healthy children between the ages of four and ten years and send them separately to ten otolaryngologists, I would defy any of these children to run the gamut of these men without meeting the statement that the tonsils needed to come out. In other words, near the age of ten when there is increased tonsillar tissue, there is great tendency to hold that gland under suspicion in spite of the condition of the patient's health.

I think we are all convinced that some of the most beneficial results we have seen have come in those cases in which the tonsil has not been largest and interfered most with the air tract. These are the cases in which we have the most manifest type of local infection. That brings me to the point, that we have always to consider the tonsil in its relation to the metabolism of the individual as a whole. We may have tonsils that seem identical in two throats and in one they should be removed in order to round out a fairly good metabolism in the individual, while the other individual may retain them and get along well. I feel that the relationship of these glands with the food tract is more intimate than we have formerly suspected, and that elimination from the food and intestional tract is intimately related with the activities of the tonsil.

I find myself puzzled more often as to whether the tonsil should come out, than with the difficulty of dealing with it if it is to come out. This last year I had an unpleasant experience in the case of a man 65 years of age. This man had developed arteriosclerosis and marked renal and cardiac insufficiency. He was confined to his room by this latter for several months. He finally recovered sufficiently to leave his home and was under the care of Dr. Martin Fisher for a time. After marked improvement in his health he was told that he was in condition to stand the removal of his tonsils, which were manifestly diseased. He was later brought to Columbus and put in my care, and with the letter of Dr. Fisher and the approval of his family and of competent internists in Columbus, under local anesthesia, I removed his tonsils. It was practically a bloodless operation. The operation was done in the morning and at 5 P. M. the patient was feeling first class and took some liquid nourishment At 8 P. M. he got drowsy and stupid and continued somewhat so all through the night. At 3 A. M. the pulse became rapid and before I could see him, or the internist associated with me, he died. In that case we were too bold; the man did not die of hemorrhage but of surgical shock. If the man had been subjected to palliative treatment, he might have been alive today, but he is dead and I think we made an unwise decision in his case.

Dr. L. W. Dean, Iowa City, Iowa: I would like to add to the list of indications for the removal of adenoid tissue from the nasopharynx and oropharynx. Because of repeated attacks of acute rhinitis or acute paranasal sinus disease, especially in children, I frequently remove adenoids and diseased tonsils. In chronic rhinitis in children and adults with acute flareups we get better results from this procedure than from treatment of the nose. In paranasal sinus disease in infants and young children we have eradicated the disease in eighty per cent. of our cases by the removal of diseased adenoid tissue from the nasopharynx and the oropharynx. The removal of adenoids alone is not always sufficient. In a little patient two years of age, four months of constant treatment did not eradicate a chronic paranasal sinus disease. The adenoids were early removed. The patient had a posterior cleft. Closure of this should not be attempted in the presence of paranasal sinus infection. We disliked very much to remove the faucial tonsils because the resulting scar tissue might interfere with the closure of the cleft. Finally we did remove the faucial tonsils and within a few weeks the sinus disease disappeared and the posterior cleft was successfully operated.

Dr. Keiper mentioned the direction of the lymph current. In disease of the lymphatic system we frequently get a reversed lymph circulation. A primary carcinoma in the mediastinum may have a metastasis at the angle of the jaw, the cells being carried up in the neck by reversed lymph currents.

Dr. Thomas O. Edgar, Dixon, Ill: Although there is not unanimity of opinion as to the value of the coagulation time of the blood, it is certainly occasionally of value.

Undoubtedly most hemorrhages occur during and after the operation, due to the lack of the surgical procedure usually followed in other fields, namely: securing the blood vessels. In order to see what one is doing, an important point is to have a good anesthesia. Having waited a minute or two for the smaller vessels to stop bleeding, after holding a sponge in the fossa, one examines for the chief bleeding points. Each one of these should, if likely to continue bleeding, be tied either with a ligature or a suture. By means of a Shoemaker's forceps, it is comparatively easy in most cases to use a ligature. The fingers are in most cases long enough to finish tying but occasionally the ligature tyer devised by Dr. Boettcher will be found convenient in other cases where the tissue is either too firm to get hold of or where the bleeding point is in a deeper sulcus, or where there is a plexus of vessels or a larger surface than one can get hold of with the forceps. Since following this plan it has not been necessary for me to go to the hospital in cases where I have my own anesthetist in order to stop hemorrhage.

Dr. Daniel W. Layman, Indianapolis: Is the removal of tonsils in children under six years of age justifiable as a prophylactic measure when there exists but a slight indication for their removal? I recommended this procedure in my paper Dr. Keiper referred to and also in a paper that I read before the Indiana State Medical Association in 1919 on "The Relation of Oto-Laryngology to Child Hygiene". I based my contention on the attitude of the children's specialists and the internists and also on the statistics reported in the paper in the symposium on Child Hygiene. I refer to Dr. La Fetra's answer to my letter, asking him whether the removal of tonsils had any effect whatever on the further development of the younger children that came under his observation. He answered as follows: "In answer to the inquiry in your letter, I write to say that I have never been able to notice any abnormality in growth or development in those boys and girls whose tonsils were removed in early childhood. Whatever advantage the tonsils may have physiologically, it would seem that nature has provided sufficient other tissue of the same sort to take up vicariously the work of the tonsils when these are removed. As regard their susceptibility to disease, I would say that children whose tonsils have been removed are much less susceptible to respiratory and gastro-intestinal disturbances of all sorts, moreover, when they have measles, scarlet fever or whooping cough, the disease is much less pronounced than if the tonsils had been present."

In the symposium on Child Hygiene, I mentioned the statistics tabulated by Dr. Henry H. Forbes of New York City. In the summary of his report, Dr. Forbes shows that from 80 to 100 per cent. of the contagious disease cases had tonsils present.

Dr. Lynah, of New York City, wrote me as follows: "In our contagious disease hospitals the percentage of admissions in whom tonsillectomy has been performed is from 2 to 4 per cent. The 96 to 98 per cent. have tonsils in various degrees of sizes."

In my own cases, I noticed that many of the children from whom the tonsils have been removed are not entirely immune from cough, nasal colds or even ear disorders. However, it was apparent to me that the younger class under six years of age was more susceptible to these affections than a class of children operated between 8 and 12 years

of age. But even if the tonsils in young children serve as defense in establishing immunity in certain affections or ailments, my contention is that these postoperative ailments that may follow because of this lack of so-called defense are trivial as compared to the severe contagious diseases and complications a tonsil child is liable to contract.

Dr. Norval H. Pierce, Chicago: It seems to me that we are getting into a position in the tonsil question similar to that we now hold regarding accessory sinus trouble. It is evidently becoming very much more conservative. It is a difficult question to deal with. I depend largely on the history of the case. I think that is the most important point. If you have a case of a child or adult who has rheumatic symptoms accompanying or following tonsillitis, there is strong indication that the infection has occurred through the tonsils. If there is any tendency for inflammation in the joints to persist, the indication is accentuated for removal of the tonsils. If a person has no symptoms of distant infection, but has a history of repeated attacks of tonsillitis, I think the indication is present for the removal of the tonsils. The flora of the tonsils can give us little aid in our decisions.

The cheesy masses I do not regard as an indication per se for operative interference. The enlargement of the tonsillar cervical lymph node would help to decide the question.

I am very charitable when patients come to me with chunks of tonsil in their throats for reoperation, and I have endeavored so far as possible to sustain the reputation of my colleagues.

Everybody that I know, so far as I have seen the patients, has the same recurrences and these reformations of lymphoid tissue are subject to inflammation. Just a little while ago I had a real abscess at the base of the tongue in the adenoid tisssue remaining after a complete tonsillectomy. It was drawn up from the base of the tongue. I did the operation and did it as well as I knew how and yet there was this mass of extra-tonsillar tissue. Where does it come from? Is it from the base of the tonsil pulled up into the scar tissue, or is it tissue which is in the so-called capsule of the tonsil itself? I believe that is the case in a great many instances, and it is the only way I can explain some of my cases. There are two types, one where the lymphoid tissue at the base of the tongue is drawn up by a contraction of the scar in this capsule, and another where a globular mass unconnected with any kind of tissue at the base of the tongue recurs, and this mass frequently occurs in the middle of the fossa or at the apex. How to avoid this I do not know.

Dr. Otto J. Stein, Chicago, Ill.: I do all my tonsil work under a general anesthetic. I use a ring snare and in that way I minimize the amount of manipulation. I think if you can lessen the mere contact of anything in the throat you lessen the tendency to reaction. Use no manipulation except to put your finger against the pillar to stay the tonsil and give a proper fulcrum to the instrument, and slowly tighten the wire and you will never have much bleeding. If there is bleeding do not touch the throat at all unless there is spurting. Always lay the patient's head on the side and allow the blood and secretions to flow to the cheek. Use the suction apparatus for removing the blood from the cheek. In that way there is very little interference with the field of operation. After the operation never introduce anything in the way of styptics, as iodine, or guaiacol, of tannate of glycerine—or turpentine, as was mentioned this afternoon—or other remedies. Not because they have no advantages in checking bleeding, but in order to avoid manipulating the throat in the slightest degree. Ordinarily the oozing that may result will stop soon afterward and what there is can be sucked out of the cheek.

The preparation of the patient before the operation is also very essential. The cleansing of the teeth and washing out of the mouth

with as nearly a biologic preparation as you can get. I mean to say normal salt and sodium bicarbonate solution.

Dr. E. W. Wales, Indianapolis, Ind.: I have had three cases of hemorrhage five or six days after the operation. In one case the general man had used argyrol locally, and two of these three patients would not eat anything. So after operation I always insist that my patients take a lot of fluid, milk especially, and I think the more they eat the quicker the wound heals. I also think it is important to keep the bowels open and give no local treatment.

Dr. H. W. Lyman, St. Louis, Mo.: The present discussion of the tonsil would not be complete without calling attention to a paper entitled "Semi-suspension in the Treatment of Tonsillar Infections" read by Dr. Frank D. Sanger of Baltimore at the meeting of the Southern Medical Association last fall. He said that toxemia following tonsillar infections was due to lowered elimination because of limited fluid intake resulting from the pain caused by swallowing. He said that any patient suffering from tonsillar infection could be relieved of this pain by placing a full tumbler of the fluid to be taken, in the patient's hand, then standing behind the patient and grasping each side of the head with the two hands encircling the ears, taking care not to press upon the neck behind the angle of the jaw, which is usually painful; then raising the patient up, and directing him to drink at the same time that he is being raised. He will then be able to swallow fluids without pain. This being the case it is easy to force fluids in these conditions and the toxemia disappears as if by magic.

I think the explanation of this method is anatomical. The muscles between the styloid process, the fauces and the hyoid bone, and between the hyoid bone and the sternum, are placed under tension and this prevents contraction of the fauces, which is usually the second phase of the act of swallowing, and the fluid is "poured", so to speak, directly into the esophagus. This absence of faucial contraction can easily be seen by directing a person to swallow while suspended in this manner.

I consider this the most important contribution to the tonsil question that has been made in the last few years. It is such a simple and efficient procedure, and "it does the work".

Dr. Charles M. Robertson, Chicago, Ill.: It is not necessary to remove the entire tonsil to get rid of infection. In a series of 500 cases examined microscopically the tonsil was found to be infected only in the superior crypts and if we take that portion of the tonsil away we have removed the infectious area, so it does not make much difference whether the lower portion of the tonsil comes out or not. The only exception to this is in the case of the small tonsils which are found in patients who have arthritis. A case of that type occurred in my practice, in a man who had arthritis to the extent that the vertebrae were nothing but a shell. He had a locked jaw to the extent that the mouth could be opened only far enough to get in my index finger, and he had constant and intense pain. He was examined by an orthopedist who sent him to me and I sent him back with the statement that he had not enough tonsil to pay any attention to. He sent the man back again saying there was no other possible focus of infection and asked me to take out what there was. I removed his tonsils and made an autogenous vaccine of the tonsil material, with the result that the first injection of the vaccine relieved him of the pain and within six weeks he could move his head slightly. He had a glass cast put on his spine and went home comfortable, although his vertebrae were practically destroyed. In my opinion it is not the size of the tonsil but the character of its tissue that counts.

The matter of having tonsillar tissue recur does not amount to anything. We all see it. It is just like any lymphoid tissue and if it is not infected it does not amount to anything.

The vicious part of the tonsil is the part that contains the superior crypts, those crypts that empty into the superior tonsillar fossa. In the 500 cases examined no case was found in which there were infected crypts that emptied into the fossa direct, and for that reason I say that is the upper portion that should come out.

I have recently seen a case of lung abscess following tonsillectomy but never in my private practice. The case I refer to was in a child of eight who, when I saw her, was in complete shock. The operation was done at about eleven o'clock in the morning and by evening the child was almost dead. She was almost exsanguinated and cyanotic. The physician in charge thought the child had a diphtheria coming on because the tonsil was all covered with exudate, probably traumatic from operation, so he gave her 6500 units of serum. The child breathed poorly and became cyanotic requiring artificial respiration for several hours. The child went through the night fairly well. At nine o'clock in the morning of the following day I was in the hospital and was called in. I did not know whether the child had diphtheria or not as the entire pro-pharynx was covered by exudate but the condition was so urgent on account of material in the trachea and the cyanotic appearance that an emergency tracheotomy had to be done in the bed, and it had to be done with the head turned to one side under local anesthesia. The child developed a typical aspiration abscess from blood that went down into the lung without the knowledge of the doctors who operated. I think this abscess might well be called an accident during narcosis.

Dr. B. N. Colver, Battle Creek, Mich.: There is one point that I do not think has been mentioned today and that is the endocrin situation. I suppose you have all noticed cases in which the circumference of the neck will go down a short time after operation. A case was referred to me by the home physician not long ago where there was no history of tonsillitis, but the patient was puny, lacked appetite, was peevish, sensitive, etc. The tonsil was found to be definitely pathological and was removed. Within a month the patient was a new boy. The question in my mind is, was it the toxic effect or was it not an effect which might have been brought about through the endocrin system?

Dr. D. T. Vail, Cincinnati, Ohio: In one respect the tonsil operation stands unique among all operations on the human body. It leaves the wounds open. In all other operations the wounds are closed and protected against outside infections. In doing this it violates a well known surgical principle. Furthermore many regard the tonsil operation as a trivial one. They operate in their offices or in a hospital and allow the patient to go about as he pleases with a large open wound in each side of his throat. It is no wonder that secondary complications, bleeding, lateral pharyngitis, recurrent growths, contractures and deformities resulting from slow healing occur such as was mentioned here today. There seems to be no practical way to close these wounds at the time of operation but we should at least confine the patient away from unnecessary exposure for a few days or until nature can cover the wounds with protective lymph.

Dr. George E. Shambaugh, Chicago, Ill.: Where the indications consist of local symptoms relating to the tonsils we should be better able than anyone to make the proper decision, but very often the reason for the removal of the tonsils is because the patient suffers from systemic infection. In such cases we are not infrequently called upon to remove the tonsils even where there is neither a history of attacks of acute tonsillitis or where the examination of the tonsils discloses a con-

dition which in the absence of systemic infection would justify their removal. In just these cases the safest method of procedure is to give the internist a plain statement of the actual conditions found on the examination of the tonsils and let him decide whether in view of the evidence of systemic infection the tonsils should be removed.

Dr. Joseph C. Beck, Chicago, Ill.: If the Chairman may be permitted to do so, I would like to say a few words. First about the anesthesia in reference to lung abscess. If the general anesthetic is the cause of that condition I should have had one case at least following that method of anesthesia. If it is from blowing the ether, I have never had one—I may have within the next day, but so far I have not had.

I think one point that has not been brought out strongly enough is the preliminary examination of the patient just before operation. You may make your arrangements to operate a day or two before and in the meantime a rhinitis develops and you find the patient on the operating table with a rhinitis with glairy mucus. I have refused to operate under those circumstances.

Another point is that the anesthetist does not look closely enough at the teeth, especially in children, the front teeth being loose where the mouth gag is put in and I venture to say several teeth have slipped down and been the cause of the abscess.

In regard to the treatment with X-rays reported from Rockefeller by Murphy and his associates, it appealed to me immensely. I have added something to the procedure as published; I cannot see the advantage of allowing the ray to go through the head, and thus affect both sides.

We use a rubber in the middle of the mouth screen covered metal. We have treated three cases; one was a spontaneous hemorrhage from the substance of the tonsil, a thick, pulpy tonsil otherwise nothing wrong. This patient was subjected to this treatment and we watched its effect. There was no question about the recession of the tonsil. It is nothing new that the lymphoid tissue is affected by X-rays and I do not see why it should not be good here. Truly the crypts cannot be removed or destroyed, but they say the bacteria are destroyed within the crypts. Another case was a man with glycosuria and throat trouble. He has had three treatments in this way and we have not seen any change nor has he. The third case is in a lady with a parotid swelling in connection with an inflamed tonsil on that side. I think we have to do a little more before we can condemn or discourage this suggestion of Dr. Murphy.

MEETING OF THE SOUTHERN SECTION HELD IN ASHEVILLE, NORTH CAROLINA, JANUARY 29, 1921, UNDER THE CHAIRMANSHIP OF DR. JOSEPH B. GREENE OF ASHEVILLE.

REPORT OF CASE OF ORBITAL ABSCESS FROM ETHMOID SUPPURATION.

By CLIFTON M. MILLER, M. D., Richmond, Virginia.

Orbital abscess has been usually considered an ophthalmological condition, but from the etiology in the majority of non-traumatic cases it appears more properly to belong in the domain of rhinology. The great majority of cases of non-traumatic cellulitis of the orbit, whether they go on to resolution or suppuration, have their origin in infection of one of the nasal accessory sinuses.

The mode of infection from the sinuses varies. It may be through a dehiscence in or by perforation of the bony wall of the sinus, in these cases the abscess as it were ruptures into the orbit and the purulent cavity in the sinus and orbit is continuous through the opening. Skillern in his work on the accessory sinuses of the nose says: "The continual opposition of the purulent secretion results in maceration of the epithelium, which gradually pervades the entire mucosa until it becomes, in certain areas, loose on the underlying bone. The purulent material, thus coming in direct contact with the bone, slowly infiltrates through the canaliculae and Haversian canals (possibly with the aid of blood and lymph vessels) and eventually reaches the periosteum of the opposite side. From here on but little resistance is opposed to the spread of the infection." The infection may travel along the sheaths of the vessels and nerves. It has seemed to me that a thrombo-phlebitis of the ethmoid veins has been the cause of the majority of cases which have come under my observation.

Several cases of orbital abscess have been operated by me in the past ten years, and in all of them a careful examination of the wall of the sinuses has been made. In none of them could denudation or dehiscence be found, but in all the offending sinus was demonstrated by finding pus in it.

The ethmoid labyrinth seems to be the cause of orbital cellulitis, more frequently than any other sinus. This is particularly true in children.

The offending sinus may be suspected by the direction of the exophthalmos but the diagnosis must not be based upon this. A careful examination of the nose being indicated.

Case Report. A. J. W. M., 8 years. First seen Dec. 6, 1920. Parents living in good health. Brothers and sisters healthy.

Boy well nourished but rather small in stature. Quite bright and active physically.

Has had some diseases of childhood. Physical examination negative except condition for which he was presented.

Status presens. Father says that he has had a "bad cold" with profuse nasal discharge from right nostril for the past week. This morning he awoke complaining of pain in the right side of his head, particularly in the neighborhood of the right eye. Condition today has been not good. No appetite and does not want to play.

Examination reveals right nostril filled with profuse mucopurulent discharge. Nostril quickly fills up after being cleared out. Discharge seen coming from below middle turbinate. Gentle suction brings large amount. Slight swelling over upper inner angle of right orbit. Extreme tenderness on pressure over most prominent part of swelling. Motility of eye unimpaired.

With use of rest, hot formentations over eye, gentle suction and spray containing adrenalin there was no change in the local appearance for three days and the general condition of the boy seemed better. On the fourth day there was a change for the worse. Swelling more pronounced and painful, some exophthalmos with cornea directed downward and outward. Marked loss of motility of eye though there was still some voluntary movement outward and downward. X-ray examination at this time revealed cloudiness in right ethmoid and inner portion of right orbit. Operation was advised but not acceded to for about five days, at which time there was marked increase in the swelling and edema of conjunctiva. Exophthalmos very marked. No motility of eye, cornea turned downward and outward. Discharge from nose almost entirely absent. At no time was there any evidence of a continuity between the ethmoid and orbital abscesses. Pressure over orbital swelling caused no discharge into nose nor did forcible inflation of nose produce bulging of the orbital swelling.

Under ether anesthesia incision was made into the abscess cavity through the upper lid and about 8 cc. of pus evacuated. Careful search of the inner walls of the orbit was made for denuded bone or an opening into the ethmoid cells, but neither could be found. Wick drain inserted and wet dressing applied. Recovery prompt and uneventful with perfect vision and motility of eye. Ethmoid seems entirely free from disease at the present.

This case seems to me to have resulted from a thrombo-phlebitis of one of the ethmoid veins.

DISCUSSION.

Dr. Stucky, Lexington, Ky.: I have never seen a case of orbital abscess in a child that I did not believe to be due to ethmoiditis. At the same time, I have never seen a case of ethmoiditis in a child that was not due to infection from tonsils and adenoids. I think it reasonable that there is frequently pus in the adenoid.

I have had three cases of orbital cellulitis in children, which gave every indication of requiring incision, relieved intranasally by tonsillectomy and adenectomy.

I have had two cases of infection of the orbit from the lachrymal sac, in persons forty years of age or more. Undoubtedly the infection from the sac, was taken up by the lymphatics to the orbital tissue.

Dr. Dean, Iowa City, Ia.: Most of the cases of orbital abscess that have come under our observation were in young children. The cause of the paranasal sinus disease which was responsible for the abscess was usually scarlet fever, measles, or other infectious diseases. In children the orbital abscess in our cases has been secondary to ethmoid or maxillary sinus disease.

Dr. Miller closing: I appreciate the discussion very much. Dr. Dean asked about draining such cases internally or externally. The infection can come about in two ways, by perforation through the os planum of the ethmoid or by phlebitis without perforation. In this case, we have an abscess in the orbit without communication with the ethmoid labyrinth and the orbital disease can be cured by drainage. If there was an opening into the ethmoid, you must necessarily drain the ethmoid labyrinth thoroughly and this may have to be done by combined intranasal and external opening. None of the cases that I have had have been of this type, but had they been, I do not see how they could have been cured without ethmoid exentration, as well as external incision. I have seen no involvement of the lachrymal sac in these cases, but have always been on the lookout for it. In a good many lachrymal sac cases acute in their course, I have not been satisfied about the ethmoid condition until there was complete subsidence of the sac inflammation, feeling always that probably the ethmoid was the source of infection, but I have not always found it. I don't know whether Dr. Stuckey wanted to convey the idea that all ethmoid infection in children were due to adenoids. Anyway, in these cases, adenoids should always be removed for their presence obstructs nasal respiration and offers a field for infection that simply renders the entire nose very susceptible to the onset of pathological conditions.

THE TREATMENT OF LARYNGEAL TUBERCULOSIS

By T. E. CARMODY, M. D., Denver, Colo.

Under the term laryngeal tuberculosis may be considered anything from slight hyperemia or anemia to complete destruction of the larynx in the patient afflicted with pulmonary tuberculosis. That he may have primary tuberculosis of the larynx is accepted, but it may be said that it is not proven by careful examination by competent diagnosticians, or by negative X-ray, or by autopsy. Avenues of infection do not need to be taken into consideration, as primary pulmonary infection is found in all but a few, and as before-mentioned, these are not proven otherwise. Infection in the upper respiratory tract, as in the first part of the alimentary tract, is extremely rare as primary, although found more frequently in the latter, for obvious reasons. As we are expected to deal especially with treatment at this time, conditions will be taken up in the order of severity, the cases with least involvement first.

It is understood that the upper respiratory tract is to be thoroughly examined by inspection and any other means at our command, as it is impossible to cure or even alleviate the laryngeal symptoms in face of disease of the nasal passages and accessory sinuses, or nasopharynx, mouth and pharynx. How many cases of chronic disease of the accessory nasal sinuses do you see in patients who are also suffering from pulmonary lesions, not necessarily tuberculous. If the cases are examined carefully, the number will be appalling. The cases where these conditions have been overlooked in my practice are at least sufficient to make me uncomfortable when I think of them, and that I am not alone is also proven by my records of cases previously examined by others. If the load of infection is removed, and a thorough ventilation of the sinuses and nasal passages obtained, many cases will recover without further treatment. It is to be understood, however, that there are cases in which pronounced pulmonary change has not taken place. Our responsibility does not end with the septum or the sinuses as suggested by Freudenthal. We must correct other deformities which may be amenable to surgical treatment, or those which may be due to dietary indiscretion and which we may more easily diagnose than the internist. If we are to give the patient

the utmost benefit we must search our field carefully and diligently before looking at the larynx, for the trouble is not in the larynx, primarily, although that may be the location given by the patient, as his attention is most forcibly called to it. Passing from the nasal cavity our attention is next arrested by the oropharynx. The mucous membrane of the mouth, like that of the nasal passages, may suggest either infection or disordered function from dietary or other cause. Furthermore, like the sinuses, inspection may not reveal the whole condition responsible, and on radiographic examination an abscess at the apex of a tooth may be discovered. Pockets along the roots of the teeth communicating with the mouth at the gingival margins may also be found in this way. It is the author's opinion that too much attention is paid to the apical abscess and not enough to the so-called "pyorrhea pocket." The former is cut off from the outside air and if the leucocytic and connective tissue cordon is sufficient, very little air is supplied freely, with rapid growth of pyogenic organisms, the toxins of which are absorbed or swallowed. We have ignored the possibility of harm from the latter cause while laying too much emphasis on the former. How much difficulty does the patient with either of the above conditions have in mastication of his food, a process which is just as important as breathing. Can you expect a patient with one sore tooth to do justice to a beefsteak, to say nothing of the cases that we see with nothing but roots or a large number of crowns? Look with suspicion on the gold crown or the pivot tooth as we may have a dead tooth with both an abscess at apex of root and pocket by the side. Examine your patient to see if he masticates on one or both sides of his mouth. If not on both sides, see if it is due to his teeth, tongue, cheeks, or what is the reason. You can easily tell by the appearance of the gum tissue, that being used will show the normal pink while the other side will show turgescence or inflammation. Of sixteen hundred cases examined in General Hospital No. 21, by assistants and myself, all pulmonary cases, only fifty per cent. masticated equally. Inflammatory reaction in the mouth may be found to have traveled into the pharynx by continuity of tissue, or the reverse, or the two may be entirely independent.

Tonsils. Infection of this region is found in a large number of pulmonary tuberculosis cases as is true with the teeth. The bad results reported following removal in either moderately or far advanced cases may be due to infection of the wound at time of removal, lowering of vitality of a large area by operation, and injection of anesthetic solution, thus allowing infection from lungs or

mouth, interference with the nutrition for several days, or lowering vitality of lung tissue when general anesthetic is given. Many of these should be let alone if far advanced as they are immune to this infection, or possibly we should remove only one tonsil as we remove only one tooth. Recently a patient of mine whose vitality was not considered sufficient because of specific infection to withstand a prolonged operation, was advised to have five teeth extracted. The dentist removed twenty-nine, twenty-four of which should not have been disturbed. Within four days this patient developed pneumonia from which she finally recovered in two months. A patient with tuberculosis or syphilis should not be subjected to prolonged operation or to any operation if possible to avoid it. After we have proven to our own satisfaction that there is no cause for our laryngeal condition above, or have removed such cause if present, we may consider the larynx.

Note I. Much has been written on the treatment of established laryngeal tuberculosis, but very little on prophylaxis.

What do cases of suspected pulmonary tuberculosis show and what do incipient cases show? Most of these will give a picture of acute or sub-acute hyperemia of the larynx, especially shown as hyperemia of the vocal cords and possibly nothing more. Of the sixteen hundred cases above mentioned, only five per cent. had normal larynges. If condition is that above, the patient is advised to use his voice as little as possible, and if under control, completely silenced for from a few days to a few weeks. We will now suppose the case to be one of frank hyperemia with possibly infiltration of sulcus. The advice is the same and he is given a cleansing spray to use three times daily, being instructed to spray the larynx, not the pharynx. If the condition has advanced still further with infiltration of ventricular bands, vocal cords, and a marked infiltration of sulcus, sprays of ½% formalin in alkaline solution and applications of from three to five per cent. formalin with flexible applicator after anesthetizing are used. This treatment may be modified or added to in the ulcerated stage, sometimes using 50% lactic acid and at times the cautery. In excessive granulation, marked edema of arytenoids or bands, the cautery is probably best, either by direct or indirect method. In cases of tuberculoma when the base is broad, the cautery is most useful; if there is a narrow base or pedicle, removal with snare or biting forceps is preferable. In these cases so far mentioned care must be exercised not to over-treat, to which my attention was called in a marked case which consulted Lockard some years ago during my

association with him, and which I have observed many times since. We advise many cases to come in only for observation and if the pulmonary condition improves, they will probably give no trouble, although at times the larynx will improve in the face of failure in the general condition, the reverse also being true. It is, however, the advanced conditions that are difficult to deal with. The patient who has ulceration of the larynx and a troublesome cough, aggravated by laryngeal condition is very unfortunate. Check the cough by local application if possible, which it may be, if it is a laryngeal or pharyngeal cough, although it may be found necessary to use general sedatives if due to bronchial irritation.

Note II. In cases of ulceration with dysphagia, anesthetic sprays, orthoform powder, and emulsions of the latter give relief. This is not true of cases of dysphagia without ulceration or when the ulceration is on the distal side of the epiglottis and close to the base. In this event injection of the superior laryngeal nerve, deep cauterization, or removal of epiglottis may be found necessary.

In marked inflammation or scar formation within the larynx, intubation or tracheotomy may be performed, the latter being preferable, but it must be borne in mind that where there is much scar tissue we may and do frequently have syphilitic infection also. The patient should be told that it may be necessary to wear the tubes the remainder of his life.

The question is frequently asked, which cases should be treated in the doctor's office? The answer is, only incipient cases which are not running temperature. Many of these are better off with their home spray, as the trip to the office, the bad air on the cars in the downtown district and in the doctor's office, and the mental strain do more harm than the treatment does good.

Heliotherapy has been used with good results, both direct to the body and by reflection into the larynx with the laryngeal mirror. The latter method would seem best, but it is much more difficult to apply. The work of L. Frank, of Denver, along this line has given some good results, but requires more cases before a definite report could be made.

Note III. Climate is of undoubted value in this disease, despite arguments to the contrary. These patients, however, will do better under hygienic conditions in any climate than in the sweat shops in the same region.

Laryngeal tuberculosis cases should not be kept where the inspired air is excessively cold, although the air should be fresh and

pure. This applies especially to porch sleeping during windy weather, my advice being that during these periods it is better to sleep in a well ventilated room.

DISCUSSION.

Dr. H. H. Briggs, Asheville, N. C.: A few things are quite essential in the treatment of the tubercular larynx. First, the general management of the case must receive the utmost care by his internist, who looks after his habits, temperature, rest and exercise, food, weight, digestion, and the many things necessary to high efficiency in the struggle to convalesence, and to this end the cough and pain should receive the closest attention. The cough should by all means be allayed unless the necessary therapeutic measures are absolutely contradicted, for the cough may not only directly cause the initial abrasion of the larynx and the onset of the local lesion, but once infected the cough may do even more than the use of the voice to aggravate the lesion.

The cough may be caused by irritation from the diseased bronchial glands, or trachea, or from the laryngeal lesion, or it may result reflexly from a non-tubercular condition of the upper respiratory tract, or from the tonsils, middle ears, sinuses, nasal chambers or teeth. I have found many patients treated for pulmonary tuberculosis and cough for years, who were cured of the cough by attention to a chronic suppurative otitis media, or chronic empyema of an antrum.

Of equal importance is enjoined silence, although in some cases it mentally depresses the patient. The use of the voice moreover excites the cough, necessitating more sedative for its relief. Total silence aided with pencil and pad are absolutely necessary in every case showing a progressive laryngeal lesion.

Of late there is a tendency to use the cautery too promiscously on the initial tubercular lesions;—simple infiltrations without abrasion or ulceration. The cautery is one of the best weapons, but should be reserved for the ulcerations and the infiltrations which show a tendency to progress. I recently saw a man of considerable reputation as a laryngologist insult a larynx with a slight abrasion which was disappearing under mild lactic acid application, by a slight cautery, causing soreness, hoarseness and a rise from normal to a degree of temperature, lasting for ten days.

In progressive infiltrations and ulcerations the cautery should be used boldly, remembering that you are dealing with a lesion closely resembling a malignancy. It can be used by indirect laryngoscopy by those sufficiently dextrous, but is more accurately applied under suspension and direct laryngoscopy in a tolerant patient.

The average patient is slow to learn how to insufflate iodoform into the larynx properly. Personally I have little confidence in his applying it correctly or in its therapeutic action even if properly applied. Its excessive use may lead to a disordered digestion. I have even less confidence in sprays. A far better substitute is a simple gargle for cleansing purposes, teaching the patient to gargle so that the solution will fall deeply into the larynx.

Injection of the superior larygeal nerve, a simple technique, should be resorted to in every case where pain is severe or dysphagia limits the proper intake of food. It is moreover a humane measure fully appreciated by the grateful patient.

Dr. Dean: Dr. Minor and Dr. Carmody have discussed this subject so thoroughly that they have mentioned everything I had in mind. I approve very much of the procedure which Dr. Minor has said that Dr. Greene advocated, namely the amputation of the epiglottis whenever it is tubercular. The most excellent thing, in my judgment, in the treating of laryngeal tuberculosis is that the patient be under the direct

supervision of and the direction of a pulmonary expert. I never treat a case of laryngeal tuberculosis except with the approval of a pulmonary expert. My patients remain under the direct supervision of this expert and when he considers it advisable the laryngeal treatments are discontinued. I quite agree with Dr. Minor that every case of laryngitis should have the lungs examined for tuberculosis. I prefer to have this examination made by pulmonary expert rather than sacrifice my time. I have much greater confidence in the findings of a pulmonary expert as far as the lungs are concerned. In connection with the use of drugs for treating laryngeal tuberculosis, I was interested in getting the reaction of Dr. Paul A. Lewis. He stated that in his judgment—and this is the laboratory man's opinion—any drug that was mildly irritant or was antiseptic was just as good as any other.

It is my rule in cases where there is tubercular involvement if the tonsils show a decided infection or if they are submerged and adherent, to remove these usually under local anesthesia. Ether or chloroform is not given if there is a decided pulmonary involvement. The results in our State Sanatarium for tuberculosis, after the removal of focal infection in the throat, nose and ear have been so gratifying that this is carefully attended to as soon as the patient is admitted. Another rule is to carefully examine the lower part of the pharynx and upper larynx for incipient tubercular manifestation. Where there is a tubercular erosion, especially in the locality and of the nature that makes swallowing painful, I have found that a ten per cent. solution of chromic acid, carefully applied to the eroded area every two or three days, gives better results than the use of a lactic acid. Where this is not advisable; I have gotten better results with the use of a solution made of 1 grain phenol, 4 grains cocaine, 13 grains aspirin, peppermint water, 1 ounce. A small quantity of this is sprayed into the larynx beginning fifteen or twenty minutes before time to take the nourishment and repeating every five or ten minutes until used three times. This gives a more satisfactory and lasting anesthesia than the use of a stronger solution of cocaine or the powdered orthoform.

I think a great deal of injury and discomfort is caused by too frequent and active local treatment. It is easy to over treat, and in this way irritate the local condition. As far as practical, the silent treatment, referred to, is advantageous, but the tendency to cause despondency by depriving the patient of talking must be considered and avoided.

IN CASES WHERE CLINICAL EVIDENCE AND LABORATORY FINDINGS DIFFER—WHAT THEN?

By J. A. STUCKY, M. D., Lexington, Kentucky.

In a meeting like this it would be inexcusable to present for the consideration of the members an ordinary case report. The following three cases I feel are of such a nature and teach lessons of such importance that I am justified without apology in bringing them before you for discussion.

Case 1. A woman, age 43, consulted me in June, 1918. She presented a horrible disfiguration of the face, the right side so swollen as to be on a line with the upper part of the nose. The right eye was suffused and the entire expression of the face changed. Briefly the history is as follows: Two years previously the right inferior turbinate bone had been removed for the relief of nasal stenosis, and the right maxillary antrum had been opened to relieve an empyema. Her condition continued to get worse, swelling of the face beginning a few weeks afterwards. At this time she consulted some leading specialists and surgeons of three different cities in the East and West, all of whom pronounced it probable malignant disease of the right maxilla, and radical surgical removal of the entire bone was indicated. The blood and spinal fluid examination for lues were negative and roentgenograms indicated an increased bony formation. Except for the great swelling of the face and nasal obstruction on the right side the patient was physically in perfect health She would not consent to the radical surgical procedure which promised nothing certain except hopeless and permanent deformity. Four weeks before consulting me she visited a fourth group of diagnosticians who after keeping her under observation for several days and making all of the tests above referred to, with negative results, confirmed the diagnosis of osteosarcoma and advised operation as the only method of preventing rapid increase of the disease with inevitable intense suffering.

The patient brought with her the records of findings of six medical men whose names are familiar to most of us, with their suggestions as to diagnosis and treatment; in addition to these a number of stereoscopic plates of the head were brought for my study and interpretation. With intense earnestness she said "I have come for your opinion and any treatment that you suggest, but under no circumstances will I submit to the removal of half of my face." Her blood pressure excretions and secretions were found to be normal. She did not present the cachexia of malignancy. The Wassermann test and blood analysis was found negative. The right side of the nose gave the appearance of what I had seen in two or three instances before which proved to be a leutic infiltration. All of the upper teeth on the right side had been removed. The lower part of the alveolar process was covered by a fibroid tissue and not mucous membrane. Two small fistulous openings from the

alveola led into the antrum and through these the cavity could be irrigated. No secretion was washed out of the antrum. Transillumination as might be expected was positive on the right side. I did not have a roentgenogram made because I did not think any would indicate more than the ones she brought me. Notwithstanding the social position of the patient, her family history, and the health of her children, a tentative diagnosis was made of hyperostosis of the maxilla with gumma forming in the right side of the nose. She was placed on gradually increasing doses of iodide of potash and the succinimide of mercury. The latter was given hypodermically in one fifth grain doses once daily. Within six weeks there was a noticeable decrease in the swelling. The soft tissues covering the face began to assume normal color and the patient's general condition, especially mental, was better. After five months treatment, during which time no local treatment was used except cleansing the nasal cavity once or twice daily with a saline-alkaline solution, a large sequestrum of bone which proved to be a part of the lower portion of the superior maxilla was removed without difficulty from the right nasal cavity. The patient made a steady and uninterrupted recovery and is today apparently entirely well with little difference in the size and shape of the two sides of the face.

Case 2. Woman, age 73, came from an adjoining city to consult me on account of intense and continued pain in the top of the head, extending to the right temporo frontal region. Internist and neurologists had diagnosed the case as a probable intercranial cyst involving the silent area of the brain, as there were no localizing symptoms. She was referred to me, hoping I might find a nasal or ocular condition that might account for the pain. To all appearances her throat and nose were normal. The roentgenogram plates showed no involvement of the accessory sinus. The Wassermann test was negative. The ocular fundi were normal. She was sent home with this report to her physician.

Six weeks later she was again sent to me because of rapid decrease of vision in the right eye and the pain had increased to such an extent that opiates had to be given several times within twenty-four hours. Her attending physician told me if I could find no focal infection to account for the condition, a decompression operation would be advised. On second examination I found the right nerve head swollen with a decided neuro-retinitis, and sent her to the hospital for the removal of apparently normal middle turbinates for the relief of what I supposed to be a hyperplasia of the ethmoid. Before removing the turbinates under local anesthesia, they were fractured and pushed over towards the septum, so as to hang pendulant in the nose. This was done to enable me to decide whether the pain and other symptoms were due to an unrecognized pressure. The patient had a comfortable night without opiates and the following morning expressed herself as decidedly relieved, and asked me to repeat the operation for she was sure I had not gotten all of the trouble. The nose was again thoroughly anesthetised and both middle turbinates removed, the accessory sinuses were carefully examined with negative results; with a suction apparatus no fluid was found in the sinuses. (Much to my surprise the upper posterior half of the right middle turbinate contained an enormous cell and after separating with a scissors and snare it was impossible to remove the mass through the anterior nares. It had to be pushed back into the post nasal

space and removed through the oropharynx). The relief of the pain was almost immediate after the operation and the vision rapidly improved. She left the hospital in ten days as completely a transformed creature as I have ever seen. Her mental irritability, severe pain, and anxious expression had disappeared.

Case 3. Woman, age 29, mother of three children, had been suffering with dull, constant pain in the left parietal region for the past five or six weeks. Within the past twenty-four hours the left upper eyelid begun to swell and the swelling extending along the temple to back of the left ear. The conjunctiva was slightly chemosed, otherwise I could find no trouble with the eye. The nose, nasal pharynx, and pharynx was in good condition. She had never had any ear trouble except frequent severe darting pains in the left ear at varying intervals during the past week. The drum membrane was normal except for slight injection along the short process. No tenderness on deep pressure over the mastoid except above the usual sight of the antrum. There was pain on pressure and slight edema over the posterior zygomatic root. Transillumination of the mastoid showed darker in the left than in the right. The roentgenogram was positive. Blood count showed 9,500 white cells, and 74 per cent. polymorphonuclear. The woman gave the appearance of being very septic, and like Case 2 presented all the physical indications of being seriously ill. Notwithstanding the laboratory findings the diagnosis of atypical mastoiditis was made and an exploratory operation advised. Upon operation the cortex was found to be very thick and dense, beneath which were diploic cells, a very small antrum; the aditus-ad-antrum presented the appearance of an hour glass and was very small. The lateral sinus from elbow to knee was exposed by the suppurative process and covered with soft granulation; there was a peri-sinus abscess which led into the posterior cerebral fossa causing a small extra-dural abscess. Perforation of the tegmen antra led into an extra-dural abscess in the spheno-temporal fossa which contained at least two grams of pus. The dura was not perforated. The cells of the posterior root of the zygoma were large and filled with pus. The wound was allowed to close with blood clot and dressed in the usual way, and the case made an uneventful and most satisfactory recovery.

The above cases are presented without elaboration. Because of the danger of becoming "too cock sure" in our conclusions, and relying too completely on either the clinical or laboratory findings we are liable to make serious errors, emphasis is made that in many cases when clinical and laboratory evidence do not agree a diagnosis must be made by *exclusion* before radical surgical treatment is resorted to. Relieve the patient by combating symptoms and conditions, in a conservative scientific manner, rather than in a radically scientific one.

DISCUSSION.

Dr. Minor: Naturally, I cannot discuss this paper from a rhinologist's point of view. I think that all practicing physicians have at times been irritated by a certain superiority of manner exhibited by some laboratory men, but the fault is largely our own for we have bowed down to them too much, and have been too much impressed

with the results of their tests, and have been afraid to do our own independent thinking. If the laboratory does not agree with our findings, we promptly throw them overboard. We should remember that after all the laboratory is not any more infallible than we are, and that in the interpretation of the laboratory and bedside findings lies the skill in medical work. It is most important that the laboratory man and the clinician should feel sympathetically and work well together. The laboratory man gives certain facts which are very necessary. The clinician also adds certain facts that are even more important, not less so as so many think. From a synthesis of the clinical observation and the laboratory tests should come truth, and certainly bending down before the laboratory man in humble reverence without using our own minds is not apt to get us to the truth.

Only yesterday I saw a case which shows how badly the best of clinical men can fall down when they neglect to consider laboratory findings. A certain former patient of mine whom I had not seen for some years, began to have anginal attacks, shortness of breath and other alarming heart symptoms. He went to Chicago and saw one of the very best heart men in the country. He went over him carefully and gave him a clean bill of health. He then went back to his native town in the middle west where he was very carefully studied and the electo-cardiogram I am told showed a distinct heart block. He then went on to a celebrated northern hospital where he was studied clinically, and strange to say they did not put him through the laboratory tests for the heart condition, neglected the report from his home town, told him to go home that he was all right, and could drive an automobile and live as an ordinary man. He followed this advice and was dead in a few weeks. Now it is not that the men who examined him were not first class men. There are no better in the country. But in this individual instance they neglected the laboratory report, and were too cocksure, and certainly cocksureness is a most dangerous quality for a doctor. On the other hand, one can give plenty of examples where the laboratory man has been too cocksure and neglected the clinical findings. After all, as I have said then, it is only in a correlation of the work of both men that satisfactory results can be gotten.

I recognize that many tuberculous patients take ether and escape without any injury at all, but in view of the number who I have seen run into an active tuberculosis it is wise I believe to insist on gas, oxygen anesthesia.

After operations where ether was used, I have seen cases go into florid phthisis and be dead in a very short time. Again after operations on tonsils or larynx, I have seen pharyngeal or pulmonary tuberculosis develop and run a fatal course.

As regards the use of iodoform, I can only say that I know of none who has had a longer or more thorough experience with it in tuberculosis of the larynx than I have, and that I have no doubt of its good effects. I am a pragmatist, and even if some of you gentlemen do differ, when I get the results that I get, I am perfectly willing to continue to use iodoform despite your doubt. As I have said iodoform irritates or nauseates some patients, when it should be quickly stopped, but there are many whom it relieves better than anything else I have tried, and its effect in causing the disappearance of tuberculous infiltrations is remarkable. Dr. Carmody is perfectly correct in saying that laryngeal patients should not do regular outdoor sleeping. All my laryngeal patients have orders to sleep in rooms with open windows but not on the porch. Further the laryngologist who does not take the trouble to watch his patients' lives and lets them run around town doing foolish things, is of course not going to get any good results. As to endo-laryngeal surgery, I am glad that the furor for it, following the lead of the Germans, some fifteen years ago, has died out, and that while there are certain cases in which it offers valuable assistance the average American laryngologist is not likely to do a large amount of

this surgery in tuberculous cases. I can agree with Dr. Dunn heartily as to the great value of tuberculin in the treatment of tuberculosis of the larynx. The opportunity also to watch its effect during treatment is very fortunate, and the results gotten in my experience very good.

As to silence we all admit it is a very valuable thing, but it must be remembered that it is a psychological fact that continued silence has a very depressing effect upon some patients. It cuts them off from association with their fellow patients, starts them introspecting and thinking of themselves, and therefore can be bad. Of course it largely depends upon the nature of the patient. I have seen some patient who could stay silent for ever, and not worry about it at all, indeed whom it was hard to get to talk again, but many I have seen demoralized by it, in which case I always make a modification of my rules.

Dr. Briggs: The rhinologist, like the internist, sees cases where the clinical findings do not corroborate the laboratory findings.

In Dr. Stucky's second case the report of the woman who was seventy years old with optic neuritis relieved after removal of the middle turbinate, I can hardly see how pressure in the nose alone was responsible for the optic neuritis. The operation in some way must have relieved an infection existing in an adjacent sinus yet unnoticed or the operation may have been a coincidence to a spontaneous recovery. I have seen relief from headache and eye strain after the removal of nasal obstruction, but have yet to see a case of optic neuritis caused by pressure from spurs, enlarged turbinates or other malformations.

MONOCULAR RETROBULBAR OPTIC NEURITIS CAUSED BY PURULENT MAXILLARY SINUSITIS.

By J. W. JERVEY, M. D., Greenville, S. C.

In discussing a paper by L. A. Coffin, of New York, read at the annual meeting of the American Laryngological, Rhinological and Otological Society in 1917, on the subject of the relationship of the nasal accessory sinuses to diseases of the eye, E. S. Thomson, of New York remarked that it was hardly necessary to take the maxillary antrum into consideration. Whereupon J. A. White, of Richmond, related a case of a middle aged lady who had a retrobulbar neuritis which was blinding her and which promptly cleared up upon washing out the antrum.

At the 1920 meeting of the Midwestern Section of the Laryngological, Rhinological and Otological Society, H. B. Lemere, of Omaha, recounted a case of optic neuritis which responded to treatment of the maxillary antra.

These are the only two cases I can recall or find after a hasty review of the past few years' literature which directly connect pathology of the antrum of Highmore with optic nerve pathology.

In the past fifteen or twenty years much has been said and written about ocular and orbital disease secondary to disease of the paranasal sinuses, and a few years ago, the late Christian Holmes, of Cincinnati, even went so far as to say that he believed forty per cent. of all eye diseases had their origin in the nasal accessory sinuses. Owing, however, to the close juxtaposition, amounting almost to contiguity of the optic nerve with the posterior ethmoid cell and the sphenoid sinus, it seems to have been more or less commonly accepted that optic neuritis, when due to sinus infection, is the result of pathological changes in these posterior sinuses.

L. E. White, of Boston, in a very interesting and valuable contribution read at the annual meeting of the Laryngological, Rhinological and Otological Society in 1919, reported some seventeen cases of retrobulbar neuritis, occurring as a result of infection of the posterior ethmoid and sphenoid sinuses. He gave an enlightening resume of the literature, but in no case was there any reference to the maxillary antrum in this connection.

But inasmuch as a large part of the orbital floor is constituted of the roof of the maxillary antrum, it would seem to require no great endowment of genius or credulity to conceive and believe that antral infection could and does at times involve the first nerve and its environs in the orbital apex.

I am glad to be able to supplement the two cases referred to at the beginning of this paper with one of my own, seen in the fall of 1920.

CASE REPORT.

Case: Miss B. J., a country girl of 16 years, of good health and strong physique consulted Dr. C. E. Crosby, of Greenwood, S. C., in September, 1920, complaining of styes on the lids of both eyes. He found she had a high compound hyperopic astigmatism, which, upon correction, gave a best vision in the right eye of 20/40, and in the left eye, counting fingers at eight feet. (Note it was the left eye in which vision was the worse, and this fact supplied an interesting feature of the case). One week later the patient said she "felt something pop in upper part of left eye," and on returning to Dr. Crosby he found V. R. (with correction) equaled 20/20, V. L. equaled light perception only. At this time blanching of the left papilla was noted and some enlargement of retinal vessels. Diseased tonsils were discovered and their removal advised.

About one week later the vision in the right eye began to fail, and various X-ray and laboratory examinations failed to reveal the cause of the trouble. In other words, a thorough preliminary study of the case had been made when, at this point, I was called into consultation.

October 18. Examination discloses V. R. equals 20/200 and with correction equals 20/100. V. L. equals light perception only. The field of vision of the right eye (campimeter) proved to be severely narrowed, having central vision and only five degrees in upper and nasal fields, with about twenty degrees in lower fields and ten degrees on the temporal side. The vision of the left eye was too bad to chart the field. The ophthalmoscope showed normal eyegrounds, all media clear. There was noticeable tenderness on pressure over whole of right maxillary antrum, and radiographs showed a faint cloudiness of this sinus. Transillumination by palato-orbital route also revealed definite though not marked cloudiness in this area. Right middle turbinate cystic. No discharge in nares. Large chronic inflamed tonsils and a large adenoid were noted. The history of the case seemed to indicate that the left eye was amblyopic as a result of the high refractive error, and the probable diagnosis of right retrobulbar neuritis, previously made by Dr. Crosby, was concurred in.

October 19. The right middle turbinate was resected and the whole ethmoid line was opened. No pus or granulations were found. There appeared to be no sphenoid opening in the anterior wall, and entrance was made with a Grayson burr. The sphenoid was seen to be absolutely sound and normal. The naso-antral wall was then opened and the antrum irrigated, a large quantity of pus being evacuated.

October 21. V. R. (with correction) equaled 20/70.

October 22. Irrigated antrum.

October 23. V. R. (with correction) equaled 20/50.

On October 29 the tonsils and adenoid were removed. Antrum irrigations were continued every two or three days.

November 2. V. R. (with correction) equaled 20/40; very little pus remaining in antrum.

November 4. V. R. (with correction) equaled 20/20; pus gradually disappearing from antrum.

December 7. V. R. (with correction) equaled 20/15; antrum seems to be clean. The left eye remained amblyopic.

It is true the tonsils and adenoid were removed during the course of treatment, but inasmuch as the ocular condition had shown immediate and continuing marked improvement following the evacuation of the antral pus, steadily progressing during and after tonsil operation, it seems fair to conclude that the maxillary sinus was the real atrium of infection.

AN INVISIBLE SCAR METHOD IN COSMETIC NASAL SURGERY.

By IRA FRANK, M. D., and JEROME F. STRAUSS, M. D., Chicago, Ill.

We have for some years been rather dissatisfied with the usual methods of approach in cosmetic plastic surgery of the nose. This dissatisfaction we have felt most keenly in those cases where medium degrees of deformity are presented for correction, such cases carrying with them especially serious hazards for the conscientious surgeon. The failure of an operator to produce desirable results in extreme plastic cases such as old third degree burns, gunshot wounds of the face, and crushing injuries of the nasal bridge, may be countenanced by the patient, and by surgical colleagues—the condition is at least not likely to be worse after operation than before. But in the plastic operations of less degree a far greater responsibility rests with the surgeon; in these cases the patient must be submitted to the minimum amount of risk of cosmetic injury and infection to the end that no disfigurement shall be added to, or substituted for, the original deformity.

The operations of modern plastic surgery of the nose may be classified into two main divisions:

1. Serious malformations, not only of supporting structures but also involving the cutaneous covering of the nose, such as may be produced by crushing injuries, lacerating wounds, cured malignant new-growths, granulomas, etc., with marked destruction of the organ and loss of tissue.

These cases have been treated for years with varying satisfaction by the old Italian and the Indian flap methods, and have no place in this discussion.

2. The second group (by far the most numerous in our experience in civil practice) consists of defects of milder degree—moderate deformities of the supporting structures which go to make up the nasal bridge and not involving the skin of the nose. These are the saddle noses, the humped or hooked noses, and the abnormally broad noses, possessors of which may suffer embarrassment and mental anguish in business life and social intercourse. It is in this type of case that a special responsibility is presented to the rhinologist, in that a correction must be made with the least possible risk

to the patient in the matter of finished result, and that the offending feature be made an asset instead of a liability.

The intranasal operations, (of continental origin,) have been largely used for the correction of these milder deformities. The method consists of an incision made through the mucous membrane of the nose above the superior edge of the triangular cartilage, or at the junction of the frontal processes of the maxillae with the lateral nasal cartilages. Through this incision the periosteum of the nasal bridge is elevated in the midline; humps are reduced to becoming contour with suitable rasps; and for broad noses, by specially constructed saws, the frontal processes of the maxillary bone are sawed through, fractured, and held in proper place by external and internal splints.

The external method, used in America among plastic surgeons, consists of a small horizontal incision over the bridge of the nose at the level of the inner canthi, through which the periosteum of the midline is elevated downwards to the tip. With the field thus prepared, humps are removed, or, in the case of saddle noses, suitably shaped bone or cartilage grafts or plates of inert rigid substance (French ivory) are inserted.

The chief disadvantage of the first or internal method is, of course, the inability of the surgeon to sterilize properly the operative field; and for this reason above all others we have hesitated to subject our patients to such a risk, a risk seemingly out of proportion to the end in view. Further, in our earlier work, when this method was used, we were in many instances unable to gain a satisfactory breadth of operative field on the nasal ridge without running an additional risk by making a similar incision on the other side.

This method may be used in the three principal types of deformities, but is most successful in the hooked nose which is reduced by saw, rasp, or spokeshave. The broad nose requires a bilateral intranasal incision in order to reach both frontal processes with the saw, which doubles the risk of infection; while in the depressed or saddle nose the suitable graft is passed through the questionably sterilized nostril to the bridge of the nose. This operation we have attempted with subsequent regret.

The external or intercanthal operation is a vast improvement upon the foregoing method and seems now to be gaining in popularity throughout the country, though it is applicable only in humped and saddle noses. It offers a sterile field and a more

direct approach to the nasal bridge. In our own experience, however, we have had one regrettable infection of unknown origin, which seriously threatened the final result and terminatd in an embarrassing scar on which a secondary plastic operation was indicated. We have also had occasion to regret the resulting scar in a number of other post-operatives by this method.

This unreliability of the result so far as scars are concerned, even though the majority of the cases operated on were satisfactory, offered us a problem of some importance, and our inability to remedy the broad nose through the intercanthal opening gave added significance to our problem.

We have therefore modified the external method of operation in a manner which has proved exceedingly satisfactory in our hands. We claim no striking originality in either the method or the technique, and we present it merely as the solution of our problem. We have found that we are able now to operate successfully upon either of the three types of bridge deformity through an incision made in a field readily sterilized and in a location sufficiently hidden to relieve us of all anxiety should mal-union, infection, or pigmented scar persist.

Technique.

Before entering the operating room the patient's face and forehead is thoroughly washed with soap and water. With an indelible pencil a line one quarter inch in length is drawn on the horizontal axis of the left eye-brow, as close to its median extremity as it is possible to approach without extending beyond the hair line. The brow is then partly or wholly removed with scissors leaving the pencil marked location of the incision plainly visible on the skin. On the operating table the eyes are covered individually with sterile cotton pads pressed with sterile water, and the remainder of the skin of the face is thoroughly sponged with ether-alcohol. The patient is then put to sleep with ether through a sterile mask which is discarded for the ether-vapor machine as soon as narcosis is reached.

The incision is made one quarter inch in length, down to the frontal bone (superciliary ridge) through the periosteum. A periosteal elevator with a slightly curved shank is introduced and the skin and subcutaneous tissues are elevated from the bone and cartilage along the median line of the bridge of the nose down to the tip, the instrument being guided in its subcutaneous course by the operator's hand.

Into the pocket thus formed a slightly curved rasp may be intro-

duced and humps removed; or in the case of depressed nose a properly prepared transplant of bone or cartilage may be inserted. For the broad nose two incisions are required; the usual one in the left eye brow, and one similarly placed on the right side. Through these openings the periosteum covering the frontal processes of the superior maxillae is elevated and a small specially designed saw is inserted. The processes are then sawn through at the base of the nasal bridge and the walls of the nose are pressed inward to a position cosmetically satisfactory and retained with an external splint of padded heavy sheet copper.

The incisions are closed with interrupted horse hair and sealed with tincture of benzoin over a thin wisp of cotton.

The skin of the nose and the lower forehead lends itself admirably to this operative proceedure. It is loosely attached to the subjacent areolar tissue, and consequently is very freely movable. Indeed in some individuals it is possible to use the straight rasps and elevators of the intercanthal operation through the eyebrow incision which can actually be moved inward until it lies in the midline.

The wounds heal very rapidly owing partly to adequate blood supply and partly to the fact that there is practically no tension to the skin. The scar is usually invisible through the regrowing hair of the eye-brow by the time the stitches are removed.

The accompanying illustrations show the few instruments necessary for this type of operation. The rasp and elevator are simple modifications of those used in the intra-nasal and intercanthal methods. They have been curved to the left to permit their use in the left eye-brow, as the left sided operation is the one of choice for the right handed operator. The frontal process saw is merely a segment of a small circular bone saw, attached to a straight shank and handle.

DISCUSSION.

Dr. H. H. Briggs, Asheville, N. C. Dr. Frank's method, with other external rather than intranasal methods of introducing a graft, commends itself to me because with the extranasal methods one need not first eradicate any existing intranasal infection prior to the transplantation, as neither the wound nor the graft invades the nasal chambers. Before it is possible to operate with any degree of safety with the intranasal method one must be assured that the nasal chambers, especially the anterior portions, are made sterile and kept sterile until healing is well under way.

A case I wish to report, is one of a young lady twenty-three years of age, who has a very marked degree of saddle nose. A history of having been dropped on her face in infancy was given. Against the probability

of its being a case of inheritance is the fact that her parents and two younger sisters are healthy, and a Wassermann just prior to the operation and one a year before were negative. The X-ray showed her to have very small frontals, almost wanting, and rudimentary ethmoids, occupying the small space left by the deformity. She had on both sides a marked atrophic rhinitis with typical crust formation. Two months treatment, both operative and topical, prior to the plastic operation was necessary to render the nasal chambers sufficiently sterile to attempt the plastic operation. On the day previous to the operation the cilia were removed from the vestibules and the nasal chambers rendered as nearly aseptic as possible.

Under ether anesthesia an intranasal incision was made just back of the left lateral cartilage and through this the tissues over the nasal bones as far as the nasion and the periosteum from the nasion upward to the height of the eye brows were dissected. The pocket was also extended laterally to the inner canthi for the double purpose of allowing greater space over the bony crest of the nose for the grafts and for drawing each inner canthus inward thereby reducing the epicanthus (Mongolian type of face) which added so much to the saddle nose deformity. The pocket was also extended downward over the crest of the nose to a point near the tip for the insertion of the lower end of the uppermost graft. Two grafts were taken from the crest of the tibia, one 28 mm. and the other 42 mm. in length, the measurements having been previously determined from the nasal measurements, aided by the X-ray. The grafts, about 6 mm. wide, untouched except by instruments, were placed the shorter one first and the longer superimposed over the shorter. The upper end of each came in contact with the frontal bones and underneath the periosteum.

Bismuth gauze dressings were placed in the anterior third of the nasal chambers and gauze dressings over the nose. Healing by first intention resulted with practically no echymosis.

Dr. Frank in closing said: It has been our custom to use cartilage almost exclusively as it can be transplanted from one part of the body to another with excellent results. It is not necessary for the viability of the transplant that it should be in contact with either bone or cartilage and as a rule we do not preserve the perichondrium. It has been our misfortune in earlier work, while using the intranasal method to have had two mild cases of infection, which finally subsided, the result being satisfactory as the cartilage seemed to take hold firmly. We think we have abolished the chance of infection by our incision.

A PALATE-TONSIL RETRACTOR PRESENTED BEFORE THE A. L. R. AND O. SOCIETY IN ATLANTIC CITY.

By JOSEPH B. GREENE, M. D., Asheville, N. C.

At the risk of adding one more instrument to the large number already used in tonsil operations, I am presenting one which has been particularly useful to me. In fact, I find it so very helpful in the dissection of the faucial tonsil that I would hesitate to attempt the operation without it. The instrument is about 9½ inches in length, with a curve at the distal end which accurately fits over the upper lobe of the tonsil. The edges of the curve are slightly serrated in order to better retract the mucous membrane of the soft palate.

After the tonsil is seized with forceps, the assistant retracts, or rather pushes back the soft palate over the upper pole of the tonsil, thus bringing into accurate view the line of attachment of the palate to that of the tonsil. The operator then with a sharp knife incises the mucous membrane at its point of attachment to the tonsil, thus

sparing not only the muscular tissue but also the mucous membrane. With the tonsil thus separated at its mucous attachment, the following steps in its removal can be made either by sharp or blunt dissection as the operator may prefer. As most surgeons experience their greatest difficulty at the beginning of the dissecting it is obvious that any instrument that will make this step easier adds distinctly to our armamentarium. This instrument finds its greatest usefulness in the so-called friable and submerged tonsil found particularly in children. As this instrument forces the mucous membrane over the tonsil, it can be readily seen that less traction will be required on the tonsil forceps, thereby lessening the danger of losing the hold by tearing. It is the experience of all of us that when the forceps once tear out by traction, each subsequent hold becomes distinctly more difficult and uncertain.

Another class of tonsils in which this instrument is of great value is in retracting the palate of adult tonsils which have been subjected to frequent inflammations, particularly those which have been the site of peritonsillar abscess.

MEETING OF THE WESTERN SECTION HELD IN LOS ANGELES, CAL., JANUARY 28 AND 29, 1921, UNDER THE CHAIRMANSHIP OF HILL HASTINGS OF LOS ANGELES.

THE ACCESSORY SINUSES AS AN ETIOLOGICAL FACTOR IN BRONCHIECTASIS.

By W. V. MULLIN, M. D., Colorado Springs, Colorado.

I intend in this paper to discuss the etiological relationship of disease of the accessory nasal sinuses to diseases of the bronchi, with the subsequent development of bronchiectasis, and I will begin by stating my own position as I have done previously. Patients with bronchiectasis will usually be found to have a well marked sinusitis, and the degree of the bronchial infection is usually in proportion to the amount of sinus involvement present, the well advanced cases of bronchiectasis having a pan-sinusitis. In going over some of the authoritative literature on bronchiectasis we have not noted such an association mentioned. There have been observations on the nasal cavities as the cause of non tuberculous pulmonary disease as for example those of Rist, Sergeant and Saylor, cited by Gilbert in a former discussion of this subject. But nowhere do we find any emphasis on an etiological relationship or on the possible pathways of infection linking the upper and lower respiratory fields. Even very recent works such as the Oxford System of Medicine and Nelson's System of Medicine make no mention of the sinuses in connection with bronchiectasis. It is of interest to note that McPhedran in Osler's System of Medicine, mentions brain abscess as a relatively frequent complication of bronchiectasis, the question immediately arises in our mind that since brain abscess is also a frequent complication of sinus disease, do not the bronchiectatic subjects in whom this complication is found, develop it not from their bronchi but from an unrecognized sinusitis. While this paper is meant to deal entirely with the sinuses as an etiological cause, I feel that to avoid confusion and make myself understood I should mention that a digest of the views expressed by McPhedran, Stengel, Powell and Hartley and by MacCallum, permitted us to make the following classification.

(1) Bronchiectasis due to mechanical obstruction. a. Foreign bodies in bronchi. b. Tumors, including aneurism.

(2) Cases of general "bronchiolectasis" in young children after acute bronchitis.

(3) Cases, especially in infants, where there is bronchial dilatation to compensate for atelectasis.

(4) Cases associated with fibroid tuberculosis, or other extensive fibrosis as after empyema or organizing pneumonia, where there is contraction and compensatory bronchial dilatation.

These four groups of known or partially known etiology, comprise a minority of the cases of bronchiectasis, and leave a majority to be classed as,

(5) Cases attributed to chronic bronchitis or to an acute bronchitis or broncho-pneumonia which has left chronic sequelae.

This fifth group of cases covers all not included in the first four, that is, all the obscure cases; in them the history is often vague and the real cause distinctly hypothetical.

Let me here review briefly some animal experimental work which I have carried on with the help of Dr. Ryder, during the last four years. The work falls into two divisions. The first, on the Lymph Drainage of the Accessory Nasal Sinuses, was reported two years ago. In it we proved by the use of carbon suspensions and tubercle bacillus emulsions that the lymph drainage of the antrum is by way of the submaxillary and deep cervical nodes: these latter in the rabbit are long nodes which take the place of the entire deep chain in man, including the retropharyngeal. From these nodes drainage passes onward by the cervical lymph ducts, the great veins, the right side of the heart, and the pulmonary artery, to the lungs. The frontal sinuses appear to drain by the same route. We believe this to be the first complete demonstration of this path. Schaeffer, in his recent book on the nose, follows Most, and carries the drainage of the accessory sinuses only as far as the retropharyngeals, and this dubiously. Andrè, working on the cadaver, concluded that drainage was to the retropharyngeal and cervical nodes, but did not completely demonstrate it. New has noted metastasis of malignant tumors from the antrum to the parotid submaxillary and cervical nodes.

In our first series we also inoculated a few rabbits in the antrum with pneumococci from a human antrum, and produced inflammation of the antrum, phlegmon of the neck, an intense tracheitis and bronchitis, and pneumonia.

In the course of the first series we became interested in the question of pulmonary involvement by inhalation. We therefore carried out another series, completed last year and in part published, in part about to be. In this second series we found that if India ink or bacterial substances were injected into the nasal fossae, or into the antrum in such amount that a good deal escaped into the nasal fossae, they were readily inhaled. In the latter case lesions or pigmentations of the antrum and lung were produced simultaneously.

Thus we have demonstrated the two routes which connect the accessory sinuses with the lungs and bronchi; the lymphatic or circulatory route which can function even in the case of an antrum which does not discharge at all into the nose, and the inhalation or bronchial route which is open to any substance reaching the nasal fossae from the accessory sinuses or elsewhere, provided it be converted to droplets, or aspirated by sudden inspiration.

Here then is the situation: A condition, bronchiectasis develops inexplicably in a certain number of cases, often with the history of acute bronchitis—a disease nearly everybody has at some time—or of bronchopneumonia, followed by chronic cough. Acute bronchitis and bronchopneumonia as well, though to a less degree are usually phases of an infection which involves the whole upper respiratory mucous membrane, often including the sinuses.

That sinus infection and acute bronchitis may develop simultaneously is hardly to be questioned. Bronchiectasis does not occur in the majority of the cases of chronic bronchitis, and the tendency is for acute bronchitis to get well unless fostered and fed by a chronic sinus infection.

I have already demonstrated two routes in which this infection may take place, add to this lowered bodily resistance due to chronic infection and I believe you have the solution. The theory that sinus disease may develop secondary to the bronchial may be put forth but this is extremely improbable since there is no ready route from the bronchi to the sinuses. The number of cases with cough, moist rales at the bases, particularly in children, who get well after early diagnosis and proper treatment of the sinuses, also disapproves it, as the case of R. L. age 10, will demonstrate when shown.

To those who are inclined to say that the large quantities of secretion coughed up from the bronchi might readily infect the

sinuses, I might only cite the similar instance in pulmonary tuberculosis without the same coincidence existing.

The co-existance of bronchiectasis and chronic sinus infection, in a large number of cases surely must be explained on other grounds than coincidence.

I asked my friends doing chest work to endeavor to find me a case of non-obstructive bronchiectasis without sinus disease, the one case coming without demonstrable sinus disease had the following history which is self explanatory:

John O. Referred by Gilbert. Age 39. Came to Colorado Springs for pulmonary tuberculosis.

History: Always well and never had cough until six years ago, or at the age of 33. Seven years ago had difficulty with stomach which proved to be an ulcer. He was operated upon for this under ether anesthesia. Began to cough immediately after and has coughed ever since. Now raises quantities of foul smelling greenish material. You will see this case does not come under class five, the one in which we are solely concerned.

1. Many of these cases are mistaken and treated for pulmonary tuberculosis, and the majority of them consult the internist and chest man first. If the patient's history of "no nose trouble" alone is accepted without a most thorough investigation of the sinuses, then the diagnosis will not be made and the best interests of the patient not served.

2. A careful search for sinus disease in the early stages of a persistent bronchitis, especially in children, will clear many cases, while it is very evident that treatment of the infected sinuses in well developed bronchiectasis will not affect a cure.

Every means has been carried out by competent chest men to rule out pulmonary tuberculosis and establish a diagnosis of bronchiectasis.

While this paper deals with the etiological cause of bronchiectasis, it is done so because it is the final sequela, and more easily to demonstrate by slides the relationship of the two existing conditions. But mention might be made of numbers of cases of chronic coughs and bronchitis where a roentgenogram would show nothing and only a careful ascultation would reveal the condition.

A careful attention to the histories of this series will show:

1. That the majority of them started with nose trouble and cough when children.

2. That the advanced cases have pan-sinusitis.

3. That the bacterial flora from the sinuses and the sputa is the same.

4. That those who have only slight sinus involvement thereby lessening their absorption do get results by treatment.

5. That a goodly number had no symptom or clinical evidence of sinus disease such as is usually manifested by discharge and headache especially where the maxillarys are involved.

CASE REPORTS.

Case 1. Miss G. H., is not one of bronchiectasis, but is pulmonary tuberculosis and is merely shown to demonstrate the pathways. You will see there is a complete calcification of the cervical glands and leading down to the bronchi. The tonsils were most likely the portal of entry in this case. They were removed under local anesthesia and a pathological examination made by Dr. Ryder. Pathological examination: Showed much infiltration and scar tissue such as is rather suggestive, though not pathognomonic of healed tuberculosis.

Case 2. Master R. L. Age 10, I desire to report in detail because I believe it shows clearly the process of development in these cases and what treatment will do when the diagnosis is made early. The family history is negative. Past History: Measles at three, tonsils and adenoid removed at four. First seen by writer at the age of six for cervical adenitis. Stumps of tonsils and remnant of adenoid removed at that time. Good recovery and disappearance of glands. Next seen in June, 1919, three years later when he was nine years of age. Mother brought him because he was having so much catarrhal dropping from the nasopharynx. Was seen several times then and was lost track of until six months later when he was again seen in January, 1920. This time they brought him for severe frontal headaches of such a degree that he could not remain in school. Double maxillary sinusitis was suspected and an X-ray plate was made with the following report: Frontals not well developed, but clear, ethmoids not definitely clear. Right and left maxillarys decidedly clouded, in fact it would be impossible to tell from the plate whether cavities were present or not. Exploratory puncture under general anesthesia of both maxillary sinuses was advised, but this was not accomplished and the boy was lost track of again and not seen until eight months later when he was referred to me in October, 1920, by Dr. H. C. Goodson with the following report:

A poorly nourished and anemic looking boy. Examination of the lungs shows rales after cough in both bases, and some fine rales in the apex of the right lung after expiratory cough. Von Pirquet test slightly positive. Urine has been examined on five different occasions and albumin varying from a slight trace to double positive each time with hyaline and granular casts found on various occasions. Examination of the sputum is negative. On October 25, 1920, under ether anesthesia both maxillary sinuses were opened under the inferior turbinate and the naso-antral floor removed with the bone drill. No

pus was found but on exploring with the probe the mucous membrane appeared to be soft and thick. A piece was removed from the wall of each sinus for pathological examination. The following is the report by Dr. Ryder: Antrum curettings: Masses of very loose edematous and congested vascular connective tissue showing marked infiltration with leucocytes, both monos and polys. Several hyperplastic lymph follicles present. Surface covered with antral epithelium showing marked papillary overgrowth. No free pus on surface. Diagnosis: Inflammatory polyp. November 15, 1920, Urine report: Clear, yellow, acid, not enough for sp. gr. Albumin negative, sugar negative. Sediment: Very few leucocytes. Chest examination: Nov. 15, 1920. Chest free from rales, no cough.—Boy has remained very well ever since.

Case 3. Mr. O. L. D. Age 24. First seen Nov. 24, 1919. Past History: Delicate child—All ordinary children's diseases. Had pneumonia at 11, 12 and at 15 years of age. Cannot recall which started first, cough or dull headaches over brows and root of nose. Has had both as long as he can remember. Has always been subject to colds. He was rejected from the army December, 1917. Spent the year 1918 in a health resort and was treated for tuberculosis in both lungs.

Examination: Infection left ethmoiditis and one large polyp growing from left ethmoid. Left maxillary sinusitis. Headaches improved after the removal of polypi from left ethmoid and irrigation of both maxillary sinuses. Cough improved under autogenous vaccine and postural drainage. Is doing hard work on a ranch.

Case 4. H. P. P. Age 23. First seen June 12, 1917. Has had frequent nose colds and cough and has soiled three handkerchiefs per day ever since he can remember, but has never had a headache. Diagnosis: Pan-sinusitis with predominance of the maxillarys. Both maxillarys were irrigated and pneumos and streps were grown from the washings. Pus was injected into a rabbit by Dr. Ryder and the rabbit died of general sepsis in three days. This patient was examined by Dr. Coakley of New York two months later and the following report sent to me: X-ray plate shows cloudiness of all the sinuses. Both maxillary sinuses operated upon and irrigation of both frontals. Report of the bacteriological findings is a gram positive coccus and a non-hemolytic streptococcus. No final report on the patient.

Case 5. Miss N. H. Age 22. First seen August 9, 1919. Past History. Has had bad cough ever since having measles at the age of three. Cannot remember when she did not have nasal discharge. Had operation for removal of nasal polypi from both nostrils in Kansas City one year ago. Had a great deal of headache over both eyes, being more intense over the right brow. Examination: Septum deviates to left. Both meati filled with polypi. X-ray: Right maxillary clouded. Frontals clear. Ethmoids not definitely shown. Refused treatment.

Case 6. Miss L. H. First seen August 29, 1919. Age 29. Past History: Bronchitis at three years of age and has coughed ever since. Has very profuse expectoration. Present illness: Came to Colorado for tuberculosis. For past year has had a great deal of pain over left brow. Cultures from secretions of nose, pneumococci and streptococci.

Examination of sputum same. No tubercle bacilli found. Examination: Shows a pan-sinusitis with increase of trouble in left frontal. No temperature. Because of severe pain, radical operation was performed on the left frontal under oil ether rectal anesthesia. Persistent treatment of the sinuses and autogenous vaccine and postural drainage have failed to give very little if any, improvement in the cough and expectoration.

Case 7. Miss A. Age 28. First seen September 20, 1919. Past History: Sent to a well known health resort in New York in 1917 with the diagnosis of pulmonary tuberculosis. When cold weather came she had to go to a southern resort because the cold weather bothered her nose. As a child she always had nose colds and at the age of fifteen she had polypi removed from both nostrils in Switzerland. At the age of 27 began to have quite severe headaches. While in the South had septum operation with complete relief from headaches for four months, but they then returned as bad as ever. Has coughed since childhood, but is sure her nasal trouble started first.

Present Illness: For the last four months has had complete loss of taste and smell, loss of appetite, great depression bordering on melancholia. Has lost twelve pounds in weight. Had severe headaches in occipital region. Has profuse cough and expectoration. Examination September 20, 1919: Polypoid degeneration of both middle turbinates and polypi in both ethmoids. Creamy pus flowing down from left middle meatus. Examination of pus. Pneumococci, staphylococcus aureus and a gram positive bacilli. Examination of sputum the same. X-ray report: Frontals absent, both antra clouded, anterior and posterior ethmoids clouded on both sides, but left more than the right. Both sphenoids densely clouded. Operation September 27, 1919. Complete exenteration of both ethmoids and sphenoids followed by great improvement in general condition. Return of appetite, taste and smell. Autogenous vaccine made from culture from nose and sputum. Considerable decrease in cough and expectoration and patient is now earning her own living.

Case 8. Mrs. F. Age 35. First seen Oct. 15, 1920. Past History: Had scariet fever at age of four. Has always coughed. Has never had headaches. At the age of 29 was told she had tuberculosis and was treated for same with tuberculin. Present Illness: Since opening the right maxillary sinus and instituting postural drainage and taking autogenous vaccine, cough has decreased fifty per cent.

Case 9. Dr. J. S. D. Age 48. Bronchitis coming on gradually for three years and in the latter part of 1919 developed bronchial asthma. Fifteen years ago had intranasal operation on right frontal sinus. Has disease of both ethmoids and both sphenoids, polypoid degeneration of both middle turbinates. Complete exenteration on both sides and pathological report, no normal tissue demonstrable. Culture taken from maxillary sinus grew pneumococci. Examination of sputum

pneumococci. Not typed. Has made splendid progress since operation. Bronchial secretion and cough almost nil. Gained twenty pounds in weight.

Mrs. F. B. Miss Mary S. and Mr. R. are shown to illustrate the point that on history and examination of nose, no evidence of sinus disease was obtainable, and it was only by X-ray and irrigation of the sinuses, that quantities of purulent secretion was obtained.

A DOUBLE SIGMOID PORTION OF THE LATERAL SINUS.

By JOHN MACKENZIE BROWN, M. D., Los Angeles, Cal.

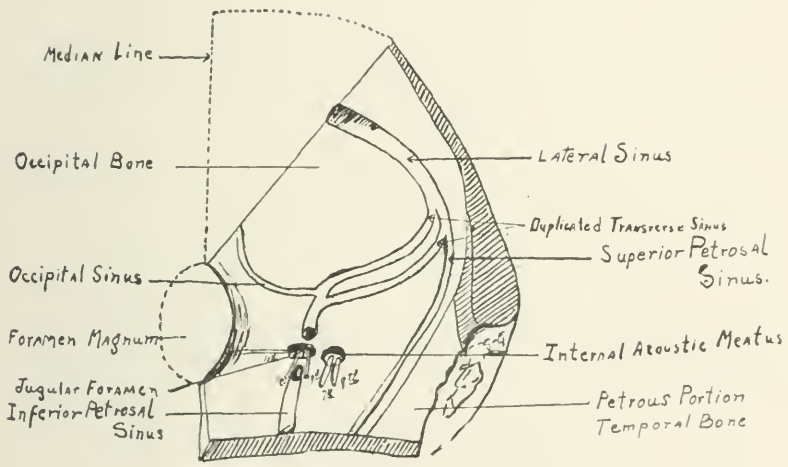
Variations of the lateral sinus and especially those regarding the reduplication of all or part of it are fairly rare, as only a few references are found in literature. Hahn in 1914 studied the question of double lateral sinuses and collected a series of thirteen cases. In his series only one case is mentioned as having a double sigmoid portion. The following cases were collected and reported by him.

Knott: One case in which a horizontal septum divided the sinus for a portion of its length. He also states that he has seen a case of diminutive size of the right lateral sinus and one case of complete absence of the left lateral, as far as the usual point of entrance of the superior petrosal sinus. The continuation of the latter with some small tributary veins formed a diminutive representative of the lower part of the sinus. Knott also mentions a case where both lateral sinuses were very small and the occipital and marginal sinuses being very large. Henle alludes to this abnormality. Sperino reports one case in which he found the horizontal portion of the lateral sinus double for one and one-half centimeters. Streit reports ten cases of double lateral sinuses collected from reports by Hallett, Meckle, Dumont and his own. Six were on the left side and four on the right. Streit's own case was one of a double sigmoid. He states that the vessels were separated by a ridge of bone, but he does not mention anything about the length of the double portion nor the exact position, except that it was found in the sigmoid portion. Heine, during a mastoid operation on a boy thirteen years of age, observed a double lateral sinus. At autopsy he found two distinct segments of the sinus. They were separated from each other by a distance of 12 mm. The two segments were about equal in caliber. The exact location of this duplication is not mentioned. Beyer, during a mastoidectomy on the right side in a boy twelve years old noted a double lateral sinus.

The specimen represents a section of the left half of the occipital bone and the petrous portion of the temporal bone. The occipital bone was not cut in the median plane posteriorly so the

proximal portion of the lateral sinus is wanting. The caliber of the left lateral sinus is apparently normal and has a total length of seven centimeters. As it approaches the asterion (junction of the occipital, temporal and parietal bone) it makes a gentle curve anteriorly and downward, at the distal half of the curve the lateral sinus divides into two parts, and the two channels are separated from each other by a ridge of bone. The distance between the duplicated channels of the lateral sinus is 8 millimeters; they are parallel to each other and again unite just as the jugular foramen is reached. The length of the duplicated portion of the

Fig. No. 1



Schematic Drawing Showing course of Lateral Sinus and Duplication of Distal half

lateral sinus is approximately four centimeters, no appreciable difference in their caliber is noted. The superior petrosal sinus terminates at the point of division in the channel lying most anteriorly. From the floor of the posterior channel an emissary vein is given off and leaves the skull through a small foramen in the occipital bone. The left occipital sinus empties into the posterior channel near the point of union of the two duplicated portions of the lateral sinus. The duplicated portion of the lateral sinus overlies the mastoid cells. The channel more porteriorly overlies the posterior margin of the mastoid cells while the channel more anteriorly

overlies the main portion of the mastoid cells. The course of the occipital sinus is abnormal as it lies more lateral to the foramen magnum than usual, its termination is also unusual as it empties into the posterior channel of the duplicated lateral sinus instead of the proximal part of the lateral sinus. Both the superior and inferior petrosal sinuses are normal in their course and termination. The sigmoid portion of the lateral sinus is duplicated and represents that part lying between the superior petrosal sinus and the jugular foramen.

The following summary of the development of the venous sinuses of the dura mater is largely based on the work and observation of Streeter and Mall:

The early drainage of the head consists of a primary head vein, which lies on the lateral side of the brain stem. It originates principally from three capillary plexuses, passes in a caudal direction along side the brain stem and terminates in the duct of Cuvier. The capillary plexuses on either side of the brain are designated as the anterior, middle and posterior plexuses. The primitive head vein as well as the plexuses play an important role in the development of the dural channels. As the otic vesicle develops, the primary head vein is deflected in its course, and soon becomes obliterated in this region. To accommodate this adjustment an anastomosis takes place between the middle and posterior capillary plexuses. This anastomosis between the two lateral plexuses represents the anlage of the sigmoid portion of the transverse sinus. The main stem of the middle plexus develops into the permanent superior petrosal sinus. An anastomosis also takes place between the anterior and middle capillary plexus, so that the only remaining part of the primary head vein is to be found lying anteriorly to the otic vesicle which develops into the cavernous sinus and caudally where it passes through the jugular foramen to become the internal jugular vein. In an embryo 21 mm. long the sinuses of the head have acquired essentially all their connections about the otic vesicle.

Streeter has followed out the development of the sinus in six embryos varying in size from 4 mm. to 80 mm. in length. In this series he finds that the primitive veins change their position for two main reasons: the first is due to some flexion or traction force acting upon the vein. The second is due to a spontaneous migration where there is a change in the position of the blood stream only by an anastomosis the blood stream develops a new

channel in the adjacent loops of the plexus with a corresponding dwindling of the previously used channel.

To explain a double channel in the sigmoid portion of the lateral sinus from an embryological or developmental view point seems plausible, if we keep in mind the mechanics involved in the formation of the venous sinuses. The sigmoid portion develops by a process of migration, that is, subsequent channels forming in new loops of capillary until a mechanical equilibrium is reached. As the growth of the head continues an adjustment of the dural channels is necessary to accommodate the new structures. It is probable that during the shifting of the position of the sinus that a double sigmoid evolves, that is: a new venous plexus develops before an old channel is completely abandoned. Under ordinary circumstances the old channel disappears when a new channel is formed. But in a case like this specimen the old channels persisted as well as the new.

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MEETING OF THE MID-WESTERN SECTION, HELD IN COLORADO SPRINGS, COLORADO, FEBRUARY 26, 1921, UNDER THE CHAIRMANSHIP OF DR. WILLIAM V. MULLIN, OF COLORADO SPRINGS.

NASAL STATUS IN RETROBULBAR OPTIC NEURITIS.

By THOMAS J. GALLAHER, M. D., Denver, Colo.

The present article is not intended to be a comprehensive presentation of the subject, but rather, a limited one.

While for many years it has been recognized that disease in the paranasal sinuses may produce affections of the eye, yet it is of comparatively recent date that critical study has been made of the relation of the posterior sinuses to the optic canal and optic nerve.

It is surprising that so few cases of retrobulbar optic neuritis, which have been relieved by nasal operations, have been reported by rhinologists, for it is certain that most of them have met with such cases.

Every case showing sudden blindness or diminution in vision should be referred at once to the oculist for a most careful examination of the eyes. The condition of the blind spot and the presence or absence of central scotoma for colors, are essential to the proper diagnosis of this affection.

Once the diagnosis of retrobulbar optic neuritis is made, the rhinologist should be consulted and the proper operative nasal procedure instituted immediately. A patient in this condition is truly in a crisis, for upon proper diagnosis and most prompt surgical interference, his vision depends.

This certainly holds good in a vast majority of cases, while occasionally a spontaneous recovery occurs, but it is not to be depended upon.

The examination should be made with all possible haste and not a single day unnecessarily lost. Atrophy of the optic nerve may occur in fifteen to twenty days, which may result in permanent diminution in vision or blindness.

The general and blood examinations can be quickly made. All possible sources of focal infection should be eliminated, such as the apical abscesses of the teeth, infected tonsils, etc. The diag-

nosis is not difficult and is characterized by sudden diminution or loss of vision, accompanied by central scotoma for colors, the disc and fundus being normal.

The differential diagnosis of optic neuritis from systemic causes, amblyopias, etc., should be made by the oculist. Optic neuritis from systemic conditions may exist in connection with retrobulbar optic neuritis. These conditions I am convinced must occur in scarlet fever and other exanthematous diseases in which there is a profound systemic infection accompanying local nasal infection.

It must be borne in mind that disease of the pituitary body also may produce similar conditions. The X-ray will be found very useful in giving the anatomic outlines and assisting in eliminating the possibility of pituitary disease.

The relation of the posterior ethmoid cells and sphenoid to the optic nerve of the same side, and to that of the opposite side, is indeed interesting and quite variable.

These sinuses may not only be in close relation with the optic nerve of the same side, but extend beyond the middle line in close relation with the optic nerve of the opposite side. It is therefore possible that either of these cavities may produce double optic neuritis, a point of practical importance. The optic nerve may traverse the cavity of the posterior ethmoid cell. Hyperplasia of the membrane, lining the posterior sinuses is the most frequent cause of this affection, with, or without, suppuration. Malignant disease may be a cause. Syphilis, as proven by the cases reported, must be a very rare cause.

If suppuration is present, the nerve may become involved by direct extension to the sheath or by the toxins. The low grade of inflammation in the hyperplastic tissue extends to the neighboring parts, involving the back of the orbit, and particularly causing a swelling of the periosteum in the optic foramen which results in a compression of the optic nerve.

The central scotoma is produced by the peripheral pressure causing a compression of the delicate fibres in the center of the nerve, which supply the macula. Hence it is one of the first symptoms.

The fundus shows no vascular changes, due to the anatomic fact that the vessels pierce the sheath back of the orbit, anterior to the optic canal.

We believe that disease in the antrum of Highmore, either of hyperplastic or suppurative, may also produce this affection by involving the adjacent ethmoid cells, which in turn may affect the

optic nerve in the foramen or in its course. Any nasal defect or systemic condition which produces nasal inflammation, predisposes to this affection.

In the hyperplastic type, the examination of the nose may show apparently a normal nostril. It should be emphasized that no pus is present. The absence of pus is indeed too often taken as proof that the nasal condition is normal.

The question immediately arises—"Is it possible for us to absolutely determine in all cases that a nostril is normal by visual inspection?"

It is not possible; because we cannot tell the condition of the membrane lining the cavities.

If, therefore, after a definite diagnosis of retrobulbar optic neuritis has been made, and no pathological condition can be demonstrated in the nose, using all the means at our command, nevertheless it is entirely justifiable to open the posterior ethmoids and sphenoids.

We have been accused as rhinologists of performing too many operations in the nose, but the results attained, in operating under these circumstances, are so brilliant, that even the most critical must be convinced of the wisdom of this course.

It is infinitely better, if needs be, to sacrifice the middle turbinate, the ethmoid cells and open the sphenoid, rather than to jeopardize our patient's vision.

In many cases abnormalities are found, such as deflection of the septum, a demonstrable hyperplasia of the middle turbinate, with its usual accompanying hyperplastic ethmoid cells.

The septum and middle turbinate should be critically examined throughout their entire length. Shrinking the tissues about the turbinate and moving it over with a spatula, may demonstrate that it is not normal.

Suppuration in the posterior sinuses, producing optic neuritis, should be promptly dealt with surgically.

The operation performed by most rhinologists consists in a correction of the deflected septum, if it exists: removal of middle turbinate and exenteration of posterior ethmoid cells; and cutting down the face of the sphenoid. Many rhinologists think it wise to make a complete exenteration of both the anterior and posterior cells in addition to establishing sphenoid drainage.

As a prophylactic measure, it may be stated that a correction of all nasal defects early in life, is advisable.

As a digression, we beg to say that we believe that paralysis of the trunk of the facial nerve, as it passes through the Fallopian canal, may be produced by a hyperplastic condition in the middle ear, or in the adjacent mastoid cells, in the same manner which causes the retrobulbar optic neuritis.

A swelling of the periosteum, in both instances is probably the cause of injury to the nerves. Both of these nerves are in a similar relation to adjacent air cavities.

In many cases where early diagnosis has been made and thorough nasal correction has been attained, the restoration of vision to a greater or less degree is indeed remarkable. And so, as rhinologists, let us intelligently cooperate with our esteemed opthalmologists to the end that we both may be the means of preserving this most precious sense.

Let it not be said of neither of us, that through a lack of interest or a thorough investigation, that a single patient has been doomed to blindness through any sins of omission or commission.

I desire to report four cases illustrating different types of this affection.

Case I. A woman, age 39, married, was seen October, 1912. For two years previously she had suffered from transient amaurosis monthly, lasting from a few minutes to a half hour with a continuous floating speck before the right eye.

The custom which was in vogue then to correct these defects by proper glasses, was carried out during that time by her oculists. The vision in the right eye suddenly fell to counting fingers at three feet,—October, 1912. The central scotoma was not reported upon by her oculists.

The nasal examination showed an S shaped deflection of the septum obstructing the left nostril in front and the right nostril posteriorly. The left middle turbinate was hypertrophied and the membrane on both sides presented the appearance of vasomotor rhinitis.

Immediate nasal operation was advised and performed, notwithstanding one of her oculists advised against operation.

The deflection was corrected, middle turbinectomy done, exenteration of the anterior and posterior ethmoids, free opening of the sphenoid. Improvement in vision for fingers to six feet occurred within forty-eight hours, and in two weeks fingers could be seen at twenty feet.

Four months R. V. 5/30 mostly to 5/15 partly. Vitreous then showed one large mass, several thin plaques and considerable dust.

Five years later R. V. 5/7. Best ever obtained was 5/6, and vitreous showed only one tiny opacity.

Had this patient been operated upon two years previously she would probably have avoided all of this trouble, and it is interesting to note the progress made in the treatment during the last ten years.

Case II. Woman, aged 45, married, seen Oct. 10, 1918.

She had been afflicted with periodic dimness of vision in left eye for five months. She was told the trouble was due to some systematic poison, but no definite method of procedure was advised or instituted by her oculists.

She was referred to me by Dr. George F. Libby, who returned the following report: "Disc margins obscure, nerve heads hyperemic and slightly swollen. No scotoma present. Diagnosis moderate optic neuritis L. V. 5/5 mostly."

The nasal examination showed septal deflection to the left causing great obstruction.

Submucous resection of the septum was now done. Improvement immediately followed, disc margins became sharper, hyperemia disappeared with vision of 5/3 mostly in each eye.

Seven devitalized teeth were extracted, two showing streptococcus viridans.

Six weeks after this the vision in the left eye suddenly fell to 5/10. Disc normal with distinct central scotoma for colors. The prompt diagnosis of retrobulbar optic neuritis was made.

The nasal operation was performed at once which included middle turbinectomy, exenteration of the anterior and posterior ethmoids and cutting down the face of the sphenoid on the left side.

In three weeks the vision had returned to normal and has remained permanent.

This case undoubtedly shows optic neuritis caused by systematic disturbance which in a short time was followed by a retrobulbar optic neuritis.

Case III. Woman, age 35, married. Ocular examination made by Dr. George F. Libby, giving the following report, Dec. 24, 1920:

During past ten years intermittent blindness in the right eye, which became permanent three months ago. In August, 1920, L. V. dropped to 5/30, rose to 5/7 partly in following three months under specific treatment.

The hematologist reported a slightly positive Wassermann by one of the refinements in the test. This was not corroborated and is open to question. I do not believe that there was any specific element in the case.

Central scotoma was present in the lately affected eye.

In November both vitreous bodies were cloudy, discs red, fundus details obscure but no intra-ocular hemorrhage, floating opacities in each vitreous. Old choroiditis lower quadrant in R. Small posterior polar cataracts.

Diagnosis of retrobulbar optic neuritis of probably four months' duration was made and the usual nasal operation was performed with the hope of improving the left eye and preventing total blindness.

In two months the vision has fortunately improved to 5/6, which we think will be permanent.

This case illustrates the fact that it is justifiable to perform the nasal operation even at a late date to preserve the remaining vision.

Case IV. Woman, aged 38, married. Referred to me by Dr. George F. Libby, who made the ocular diagnosis of retrobulbar optic neuritis. Two years ago, blindness one-half hour in both eyes.

Vision much blurred in past ten days and has floating specks before eyes. Binocular central scotoma present. R. V. 5/20 partly, L. V. 5/30 mostly, fundus normal, Wassermann negative.

Nose showed deflection of the nasal septum to the right with synechia between the middle turbinate and septum posteriorly. The right middle turbinate was abnormally close to the external wall. The left middle turbinate was apparently hyperplastic.

Correction of the nasal septum and the usual operation upon both sides was advocated. As I was leaving the city the next day one of my confréres kindly performed the operation as advised.

Two diseased teeth were also extracted and a tonsillectomy performed later. Improvement followed in a very few days after the nasal operation.

Six weeks after the nasal operation R. V. is 5/4 partly and L. V. 5/4 mostly.

In this case complete restoration of vision was obtained by prompt diagnosis and immediate operation.

OCULAR DISEASES OF NASAL ORIGIN.

By JAMES ALLEN PATTERSON, M. D., Colorado Springs, Colo.

It is a pleasure for me to know that interest in the subject of this paper is one to which the Laryngologists have at last awakened. The title of this paper is an exact repetition of one prepared for this Society in 1907 and published in Ophthalmology for July of that year.

I shall classify the subject as follows:

Diseases of the nose in their causative relation to:

First. External ocular diseases.

Second. Orbital affections.

Third. Diseases of the deeper tunics and optic nerve, as well as of the cavernous sinus.

An ordinary chronic conjunctivitis is usually caused by some morbid condition within the nose. Dr. J. Solis-Cohen (6) tells us of such an example in his friend, the late Dr. Harrison Allen, of Philadelphia, who suffered from this annoyance. Dr. Solis-Cohen frequently told him that if he would allow him to treat his nose he would cure the conjunctivitis. After being ridiculed for such ideas for a long time, Dr. Allen permitted Dr. Solis-Cohen to treat him. The subsequent cure so charmed the patient that he took up laryngology and became an eminent practitioner of that specialty.

Chronic conjunctivitis is frequently kept up by diseased conditions of the lachrymal passages wherein lack of drainage is acting as an irritant and reinfection from the lachrymal sac constantly taking place. Furthermore diseases of the lachrymal apparatus are in the great majority of cases due to an extension of morbid conditions within the nose. Indirectly hyperplastic ethmoiditis wherein the nasal secretion in the early stages is abundant and subsequently becomes lessened in quantity but more tenacious in consistence is a prolific cause, because the patient gets into the habit of dislodging this discharge by violent blowing of the nose carrying the infection into the lower opening of the lachrymal passages so that slow invasion of the lumen takes place, similar to that which occurs in the Eustachian tube and middle ear.

If you will examine the skull you will sometimes find a large ethmoid cell lying just behind the groove in which rests the

lachrymal sac. Now this thin wall which divides them as well as the proximity occasionally allows infection of the lachrymal sac to take place by this direct route. I have found a communicating passage between this cell and the lachrymal sac on more than one occasion when I have opened into the lachrymal sac from the nose to drain it for the cure of chronic dacrocystitis.

DeSchweinitz (1) aptly remarks "although it might seem natural that conjunctivitis should cause lachrymal disease this is by no means frequently the case. Conjunctivitis and blepharitis so often accompanying disorders follow rather than cause lachrymal affections. Donald Gunn thinks that the cause of mucocele of newborn children becoming afterward dacrocystitis depends upon a dilated duct, the dilatation being brought about during fetal life by obstruction of the lower end depending upon some developmental fault."

Jackson believes the stillicidium seen in young infants to be due to non-development of the lumen of the duct. In many instances I have found it due to a stoppage of the lower lumen from vaginal or other foreign secretion. It most frequently disappears by treatment of the nasal end of the duct.

Follicular Conjunctivitis.

Follicular conjunctivitis, a disease which may be confused with trachoma, is considered to be caused by malnutrition, and its management improved by tonics, good hygiene and glasses. It is a rebellious malady and occurs at the time that the adenoid tissue of the body is at its greatest activity, as Parsons (2) aptly phrases it "A pathologically allied condition."

Removing offending tonsils and adenoids, particularly the latter, gives aid to any tonic and hygienic treatment which may be carried out. Correcting refractive errors which lessens congestion and irritation of the conjunctival sac is an adjuvant not to be forgotten. Jervey (3) shows by his recent reports the consequences of confusing trachoma with this simple affection. The serious aspect of this affair is that "many school children will be stigmatized as having a disease, notoriously of uncleanliness, and will be practically compelled to submit to an operation that alone could not possibly cure them if they have malignant trachoma, and which if they have not trachoma is obviously useless and certainly not without danger to the integrity of their eyes."

Phlyctenular Conjunctivitis.

Phlyctenular conjunctivitis and keratitis are usually associated with mucopurulent secretion from the nose, nasal stenosis and ulcerations about the alae nasi. In no affection do I know of such prompt cure as is occasioned by the removal of the tonsils and adenoids. This disease was treated for years by tonics, fresh air and allied hygienic methods. As I have remarked in previous essays it is a disease of much less frequency in Colorado than in the damp regions to the east and south of us. There its outbursts coincide with the moist warm days of early spring.

I (4) have detailed in a former paper cases of unilateral lachrymation, photophobia and sometimes pain promptly relieved by draining the ethmoid labyrinth, also cases of uveitis and keratitis due to sinus affections which subsided under such treatment.

Orbital Cellulitis.

The most violent forms of orbital cellulitis are dependent upon facial erysipelas. It occurs from scarlet fever, typhoid and influenza, but it is most frequently caused by diseases of the accessory nasal sinuses. Birsch-Hirschfield (1) estimates the ratio as 60%. It is commonly seen in cases where pus has broken through the thin ethmoid plate of the orbit or has eroded the floor of the frontal sinus above the eye.

I related before you last winter a case in which pus had entered the orbit from the maxillary antrum below it. This occurred in a very young child. Last spring I showed before our County Society a case in which there was not only pus in the orbit but a paralysis of the superior oblique; the infection being due to an acute frontal sinus empyema which was relieved without scar by the Lothrop operation.

Deeper Tunics of the Eye.

Concerning the involvements of the deeper tunics of the eye occasionally we find hemorrhagic retinitis, seldom choroiditis excepting from lues, from nasal disorders.

In 1905 I made a study of the relationship of nasal disorders to vitreous opacities (5), collecting twenty-five cases. From this study I deduced "that the ordinary non-specific hyalitis is a result of a cyclitis of a low grade of activity, produced not only in myopic eyes by the systemic diseases mentioned by Hill Griffith, but that diseases of the middle meatus of the nose in

which there is imperfect drainage are liable in some instances to be a causative factor."

It has been my observation that diseases of the optic nerve, sometimes a papillitis, more frequently a retro-bulbar neuritis, are due to causes located in the posterior ethmoid cells and sphenoid cavity. I marvel at the immunity which the eye maintains to diseases of the frontal sinus, no doubt due to its more perfect drainage naturally or by means employed by the rhinologists in shrinking the tissues about the frontal duct; the severe pain of the acute onset compelling the patient to seek relief and the location of the pain making the diagnosis easier.

While the sphenoid cavity is far back and guarded in front from common nasal affections when its protecting barriers are disturbed and it becomes diseased by the proximity of the posterior ethmoid cells, its drainage is seriously interfered with or entirely blocked. We then have a cell with a small opening and hard bony walls with pus or secretion sometimes under pressure within it; there then occurs an effort to drain in the line of least resistance and that is toward the optic foramen. If you will examine automatically you will notice that the bone making the outer wall of the sphenoid cavity, though hard, is so thin that by transillumination you can readily see the outlines and movements of any small dark object held between this thin bone and the optic foramen.

It is therefore no wonder that the optic nerve suffers when infection is held in this tight walled cell, and since retrobulbar optic nerve conditions are not always visible by the ophthalmoscope even when sight has declined beyond the hope of recovery, it behooves the ophthalmologist to search promptly and persistently by methods of known worth to make an early diagnosis.

This brings us up to the use of the perimeter and perimetric methods of diagnosis. I looked forward to being able to diagnose more easily the retrobulbar conditions due to sinus affections as distinguished from other toxic causes when Van der Hoeve and others claimed that the enlargement of the blind spot upon the perimeter chart was diagnostic of sphenoid disease. Unfortunately this fact has been most disappointing although it has led to further investigations showing that central and paracentral scotomes are valuable aids. It is not within the scope of this paper to go into the perimetric diagnosis of disease but it is to warn you that many men claiming ophthalmology as a speciality

not only do not possess a perimeter but are also almost totally incompetent to use it for diagnostic purposes.

Examination of the eye ground and of the optic nerve is oft times of little value diagnostically unless used in conjunction with other refined methods of diagnosis.

Both ophthalmologists and rhinologists have at last reached the point where when in doubt as to the cause of optic nerve disturbances, other diagnostic methods such as X-Ray of teeth and sinuses, Wassermann and other examinations of the blood proving negative, to advocate operation within the ethmoid and sphenoid areas, and I want to urge you not to delay. I should rather operate too soon than to wait too long for X-Ray and blood tests to be completed, particularly if rapid loss of sight is taking place or pain and mental conditions are present, because it is astonishing how diseases in this area are prone to disturb the mentality of the individual to such an extent as in many cases to be of great value in diagnosis. I want to impress upon you the value of studying any changed attitude in the mentality of the individual.

Cavernous Sinus Thrombosis.

This is liable to occur from lesions drained by the ophthalmic vein or its branches. De Schweinitz (1) enumerates pustules on the face, nostrils or eyelids, or from purulent affections of the accessory sinus and rhinopharynx and from erysipelas and wounds.

He quotes St. Clair Thompson as stating that next to the sphenoid diseases, pyogenic affections of the ear are the most common causes. Treatment is drainage through the sphenoid and I hope we may have some discussion of these operations. I certainly believe that where thrombosis is threatened or suspected an early exenteration of the ethmoids and breaking into the sphenoid sinus is warranted in the hopes that depletion and possibly drainage may have a favorable influence. The terrible fatality sure to follow thrombosis warrants such procedures. Attention to the primary cause is of course not to be neglected.

The following illustrative cases have been seen within the past month:

No. 1. Mrs. L. Ulcerative keratitis, with chronic uveitis. A radical operation upon the antrum, double exenteration of the ethmoids with drainage of the sphenoids, relieved pain and inflammation almost immediately.

No. 2. Mrs. B. Vitreous opacities in both eyes due to chronic lacunar tonsillitis. Tonsillectomy performed.

No. 3. Mr. J. Vitreous opacities in both eyes due to chronic ethmoiditis, with much sticky secretion in nose and pharynx. Operation refused.

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ACUTE OTITIS MEDIA IN CHILDREN.

By D. A. VANDERHOOF, M. D., Colorado Springs, Colo.

A logical consideration of this subject necessarily calls for a brief review of the anatomy of the ear and of its surrounding parts, which, in a child, vary from those of an adult.

The organ of hearing is divided into three parts: the external ear, the middle ear and the internal ear; and it is in the second of these, the middle ear, that we are primarily interested. This cavity is a space located within the temporal bone, and is filled with air which is conveyed by way of the Eustachian tube. The space is of marked irregularity in shape, and contains three movable bones, which transmit vibrations from the tympanic membrane to the internal ear.

The roof of the tympanic cavity is formed by a thin plate of bone, which is the only separation between the cavity and the cranial contents; while the floor, which is also of thin bone, separates the middle ear from the jugular fossa.

The tympanic cavity consists of two parts: the tympanic cavity proper, and the attic, which is situated above the membrana tympani, and which communicates behind with the tympanic antrum, and this, in turn, with the mastoid cells. The entrance to the antrum is a large and an irregular space, which leads backward into another air space called the mastoid antrum. This communicates with the mastoid cells, which vary in size, number and shape. The membranous lining of these cells is an extension, corresponding to the membranous lining of the middle ear, which, in turn, corresponds to that of the pharynx.

The arteries supplying the middle ear are six in number: the two larger, the tympanic branch of the internal maxillary and the stylomastoid branch of the posterior auricular; and the four smaller arteries: the petrosal branch of the middle meningeal, a branch from the ascending pharyngeal, another from the artery of the pterygoid, and the tympanic branch from the internal carotid.

In the pterygoid plexus and the superior petrosal sinus terminate the veins. The plexus of nerves is formed by the tympanic branch of the glossopharyngeal, the carotid tympanic nerves, the smaller superficial petrosal nerve, and a branch which joins the

superficial petrosal. The chorda-tympani nerve crosses the tympanic cavity, which communicates with the nasal part of the pharynx by the Eustachian tube, and which is formed partly of bone and partly of cartilage and fibrous tissue.

In children, the close relationship between the brain and the antrum is demonstrated by the petrosquamous suture, which passes through the roof of the mastoid antrum, the auditus and the middle ear cavity. As the brain enlarges, the suture becomes hard and the more firmly united, until the bone covering the antrum and the tympanum becomes thicker and firmer.

The mastoid process in infants is hardly perceptible, but it develops rapidly; and by the third or fourth year pneumatic spaces develop, although at the age of one and one half years soft spaces can be found radiating away from the mastoid region.

The only parts of the ear of the child corresponding with those of the adult are the middle-ear cavity, the ossicles, and the cochlea and semicircular canals; all other parts are small, but increase in size as the child grows older. At birth, the external auditory canal is quite small, and the upper and lower walls are nearly in apposition, which causes poor drainage.

Examining the ear of a child is somewhat more difficult than examining the ear of an adult, as the upper and lower walls are nearly in apposition, and the drum membrane is nearly on a horizontal plane: but with a slight tilting of the head and a pulling downward of the lobe of the ear, a good view is usually to be had.

There are certain predisposing causes in the disease under consideration, such as debilitated condition, with or without the presence of tonsils and adenoids: also, any condition in the postnasal space which hinders the drainage of the Eustachian tube or helps to increase the susceptibility of the patient to infection. Nasal obstruction also hinders rapid recovery, which is easily understood if one will stop to consider the effect of nasal obstruction in chronic ear diseases. There are also certain epidemics of exanthematous diseases, especially that of measles, which is followed by a large number of acute ear infections. These infections may develop at any time during the course of the epidemic; sometimes they may come on early and sometimes late, not always depending on the virulency of the measles infection.

The symptoms of acute otitis media may vary, and it can not be said that in most cases the symptoms are severe in the early course of the disease; neither can it be said that the symptoms

are usually mild. Without a careful examination, it is often impossible to tell whether or not a child has acute otitis media. This is especially true in very young children. One of the most reliable early symptoms is that of temperature. When the temperature of a child ranges from 99 to 104 degrees, and no other symptoms are present to account for the temperature, the ears should always be examined. Sometimes, on first examination, it will be found that the drum is slightly congested especially around its periphery; again, the entire drum membrane may be found congested and unduly thick in appearance; again, with no more symptoms than in the other cases just mentioned, the membrana tympani may be bulging as a whole, or it may be bulging in simply a small area, especially in the region of Shrapnell's membrane, or near the center of the drumhead. These bulging areas vary a great deal in their appearance. Sometimes the discoloration in this part corresponds to the rest of the membrana tympani, which is only slightly congested; at other times it is of a dark-red color almost black, while the surrounding membrane is fiery red, with all normal outlines completely obliterated.

One of the earliest symptoms in children, besides that of temperature, is restlessness and a tugging at the ear on the diseased side. Pain itself is usually present in a severe form, yet the distress may be only a full, uncomfortable feeling.

Children around the age of three or four often complain of a stomach ache, when the trouble is found to be located in the ears. Loud crying and the throwing back of the head are often present in severe cases, and when vomiting and convulsions indicate brain irritation, operative procedure, or at least a free drainage, should immediately be considered. Tenderness behind the ear is a very uncertain factor, especially in small children, particularly when they are of a nervous temperament.

Sometimes the opening in the ear drum closes before the abscess is healed completely, and the next easiest way for the pus to discharge is through the petrosquamous suture, producing a subperiosteal abscess. This may take place suddenly, with an absence of pain. Fluctuation may be present in a few hours, with a corresponding spread of the infection in the mastoid. Sometimes the infection spreads between the inner and outer tables, where the spongy places exist. These spongy places are later the pneumatic cells, and may readily carry the infection from the antrum to other parts, such as the mastoid surface, cranial contents, or to the lateral sinus.

The discharge from acute ear infection varies in amount as well as in its viscosity. At first it is sanguinolent, and later it becomes thicker, purulent and very stringy in character. When the discharge remains from the first thin and watery, the mastoid symptoms are more severe and the general symptoms may be considered more dangerous. The virulency of the infection varies with the organism present, and, to a certain extent, with the resistance of the patient. Cases in which the discharge is watery, and remains so, I have found to be most frequently of a pneumococci infection, many of which will be found to go on to operation before they get well. The infection due to the streptococci is frequently very severe, and it is often necessary to operate to save the patient from impending dangers. Frequently the patient will seem to be doing nicely, when an added infection from one or more colds will delay the case from a rapid and uneventful recovery. The value of the Roentgen ray is beyond dispute in determining any involvement of the mastoid cells, and should be used whenever possible.

Complications in these conditions are rare, when compared to the frequency of the disease, the reason being that parents, as well as practicing physicians, call for the services of aurists much sooner than they did in previous years. The complications which are sometimes seen are meningitis, abscess of the cerebellum, sinus thrombosis and facial paralysis, but as these conditions are rare, we shall not dwell upon them here.

The treatment of acute otitis media depends entirely upon the condition of the patient when he first comes under observation. If seen early and the pain is not severe and the temperature not high, relief can frequently be given through hot irrigations and medicinal treatment. The technique here is of great importance, for, if not correct, the desired result can not be expected. In irrigating the ear, it is more satisfactory to use a two-quart irrigator with a straight tip attached, the can to be filled with warm water at a temperature of 110 degrees, with the addition of one dram of soda; and it is very important that the can should be only slightly above the patient's head. The continual application of heat in this way is soothing, and increases the circulation to the part, as well as produces leucocytosis. About ten minutes after the irrigation, a few drops of a ten per cent. phenol and glycerine solution should be instilled. This produces a certain degree of anesthesia in these surrounding parts, in addition to having an osmotic effect. As the Eustachian tube is

either partially or entirely closed in all of these cases, one-half dropperful of adrenalin inhalant and benzonol, equal parts, should be slowly dropped in the nostril on the affected side; and it is very important that the child should be lying down with the head back and tilted to the bad side. If this is done early enough in the disease, the Eustachian tube can often be opened up and ventilation enough given to relieve the increasing pressure.

The application of ice or cold in any form over the mastoid is contraindicated, if the case is one of several days' duration, or if there is any edema over the mastoid, or a prolapse of the posterior superior canal wall. If seen early, an ice cap may be used over the mastoid for from twenty-four to thirty-six hours, but should be watched carefully; for the sensitiveness of the nerve ends is lessened, which may obscure the increasing trouble.

It has been my custom to do a myringotomy instead of a paracentesis, as a freerer opening is considered more advisable. Care should be used not to injure the ossicle, and if the incision is made in the posterior inferior quadrant, there is little danger of this. Not infrequently bulging will be found in Shrapnell's membrane; so it is necessary to make a second incision in this region. After the incision, it is advisable to use a local application of heat, as this promotes suppuration and has a tendency to relieve the pain. The day following the incision, if the discharge is free, an irrigation of a sterile boracic acid solution is advisable, and should be kept up as long as any discharge is present.

Few mastoid infections would go on to operation, and the number of cases of deafness would be reduced, by resorting more frequently to early opening of the ear drum. Contemplation of this procedure is usually characterized by hesitancy, yet would it not be better to open several ear drums early than to let a single case go until it ruptures, or to wait till an operation must follow? No one hesitates about opening the drum when the general symptoms are severe and the membrane is bulging badly, but neither should one hesitate when the temperature remains elevated for a few days, even if the membrane is only slightly congested and no bulging is present. This procedure may not meet with the approval of all, yet I wish to emphasize that it will do no harm and will save our little patients many hours, and possibly days, of suffering.

THE VALUE OF TUNING FORKS IN AURAL EXAMINATIONS.

By WM. C. BANE, M. D., Denver, Colo.

Of the various tests of the sense of hearing, that with the tuning forks is the most scientific. In such a test the range and the quality of the hearing is determined, a comparison with the so-called normal hearing may be made, and the defect located; also, whether the defect is in the sound conducting or the sound perceiving division of the organ of hearing, or in both.

The normal range of hearing for tones or musical sounds is from 16 double vibrations per second to near 40,000 double vibrations per second.

The information desired from the tests is whether the lower musical tones are elevated or the upper musical tones are lowered. Also to determine whether the hearing is lowered by involvement of the middle ear or the internal ear, or both.

The tuning fork tests known as the Rinné (a comparison of bone with air conduction); the Schwabach (bone conduction compared to the normal ear or that of the examiner); Weber's test (a comparison of bone conduction on both sides through the vertex); and Gelle's (a test for stapedial mobility) have each their place in an examination of the hearing. Great credit is due these authors for the advancement they accomplished in the study of ear diseases. However, I am inclined to believe it would simplify matters to drop the names for a description that conveys a meaning.

The forks that I am accustomed to using are known as the Hartmann set. They answer the purpose for most patients. The Hartmann set of five forks represents C-tones one octave apart, that is 128, 256, 512, 1024 and 2048 double vibrations per second. For the lower tone limits the 16-64 D. V. S., fork of Deuch is highly desirable and the C^5 (4096 D. V. S.) for the upper tones.

A scale giving the time in seconds that each tuning fork is heard by air and by bone conduction by the normal ear is the basis for calculating the reduction from the normal time. The normal time of a given fork is obtained by numerous tests on persons having so called normal hearing. Each fork of a set should be tested out and record made of its time limit for bone

and air conduction tests. Downey[1] has stated that "in all tests with all tuning forks the duration of the perception, both abnormal and normal, must be determined and noted, and the difference in time between defective and normal perception of the duration of the vibrations, and not the duration of perception itself, taken as the factor of importance and the one which must serve as the index of defective audition."

Kerrison states, "The loss of hearing for the lower musical tones occurs in stenosis of the oto-pharyngeal tubes, in chronic catarrhal otitis media, or as a result of occlusion of the external auditory meatus.

In other words, lesions involving any part of the sound conduction mechanism interfere with the perception of low musical tones, the hearing for the high notes being affected comparatively little thereby. Very low musical tones represent long sound waves with slow vibrations of relatively great amplitude, whereas tones of high pitch are produced by short sound waves with rapid vibrations of very small amplitude. In the elevation of the lower tone limit, or impaired audition for the lower musical tones, we have the first functional change which is characteristic of disease of the sound conducting mechanism.

Downey's summary on conduction deafness including affections of the oto-pharyngeal tubes is concisely stated, viz: (1) The Weber (or vertex) reaction is referred to the ear complained of or said to be the deafer. (2) The bone conduction for the C^2 fork is equal to or greater than the normal in duration or perception. (3) The air conduction of C^2 fork is reduced in duration of perception as compared to the normal. Likewise for C fork, and to a greater degree. (4) The air conduction for the C^5 fork is normal in duration of perception.

Perception deafness may be considered complete when the field of hearing is as follows, assuming that the lesion is unilateral: (1) The Weber (or vertex) reaction is referred to the better ear. (2) The bone conduction for C^2 fork is negative, the good ear being suppressed with the noise apparatus. (3) The air conduction for the C and C^2 forks stimulated to the greatest intensity are negative by the stethoscope method, the good ear being suppressed with the noise apparatus. (4) The air conduction for the C^5 fork is also negative. With this fork it is particularly needful that the noise apparatus be used.

(1) Downey, J. W., "Rinné and Other Tuning Fork Tests." Annals of Otology, Rhinology and Laryngology, March 1917.

Partial labyrinthine deafness. (1) The Weber (or vertex) is usually referred to the better ear, but at times to the bad ear in cases showing but slight reduction in bone conduction. (2) The bone conduction for C^2 fork is reduced at least ten seconds in duration of perception, usually from half to two-thirds the normal duration. (3) The air conduction for the C and C^5 forks is negative or markedly reduced in duration of perception.

Partial nerve deafness. (1) The Weber (or vertex) referred to the better ear. (2) The bone conduction for the C^2 fork is greatly reduced or negative in duration of perception. (3) The air conduction for C^2 fork is better in duration of perception or reduced to the same extent as bone conduction for C^2 fork. (4) The air conduction for the C fork is of good perception duration in recent cases, reduced markedly in old cases, but never negative. (5) The air conduction for the C^5 fork is reduced in duration of perception or negative.

In conclusion I beg leave to refer you to a most excellent article by Dr. A. Retjo on "The Local Diagnostic Value of the Tuning Fork Tests" in the Laryngoscope for July 1920.

CEREBELLAR ABSCESS OF OTITIC ORIGIN, WITH REPORT OF CASE.

By FRANK L. DENNIS, M. D., Colorado Springs, Colo.

Intracranial complications of otitic infections are of such seriousness and often present so much of a problem in early diagnosis, that a discussion of this subject is always profitable.

Extradural, perisinous and brain abscess, meningitis and sinus thrombosis may have so many symptoms in common that it is sometimes difficult to differentiate one from the other, or occasionally, especially in children, it is even a nice question to determine whether there is actually intracranial mischief present.

As to the relative frequency of the various brain complications of temporal bone disease, Takabatak (1) reported from Koerner's Clinic 119 cases of intracranial lesions of otitic origin, of which 89 had one lesion and 30 had multiple lesions. Of the 89 cases there were 42 perisinous abscesses, 16 extradural abscesses, 21 sinus thromboses, 8 of meningitis and 2 brain abscesses. In the 119 cases, there were 5 cerebral and 3 cerebellar abscesses.

Statistics show that there are two or three times more cerebral than cerebellar abscesses following otitic infection. Heimann (2) collected 435 cases of abscess of which 398 were cerebral and 137 cerebellar.

Koerner's remark, that cerebral abscess is more than twice as frequent as cerebellar, is substantiated by his collection of 119 cases—almost all autopsied—in which the proportion was 79 to 40.

Interesting facts are also shown by the above authors with reference to the ages of the patients. If we divide the cases into those which occur under ten years and those which are found above that age, we find that in the cases of cerebral abscess 23% were in the former period and 77% in the latter. On the other hand, of cerebellar abscesses, only ten per cent. occurred up to the tenth year and 90% above that age.

Again, among 398 cases, 55 of the cerebral abscesses were in patients under ten years of age and 343 above that age. The count for cerebellar abscess was 16 and 121 respectively.

In Friesner and Braun's (3) series of 86 cases, cerebellar abscess occurred most frequently in the second decennium and least often in the first and sixth.

In early life, brain abscess in general is a much rarer complication of otitis than other intracranial lesions and cerebellar abscess is still less often met with. This is to be expected from the fact that abscess is much more likely to appear in chronic than in acute otitis, the proportion varying from from 3 or 6 to 1. In Friesner and Braun's series, cerebellar abscess followed acute otitis in 16.2%.

Alexander (4) says that cerebellar abscess is rarely observed in the course of acute middle ear suppuration and that it always occurs in complicated acute middle ear infection which has already led to mastoiditis, extradural abscess, intradural abscess or pyemic sinus thrombosis.

Early in the course of brain abscess, it is always situated near the part of the temporal bone that is diseased and most often the bone disease reaches the dura. Koerner (1) reports 100 cases of which 15 had more than one abscess. In 6 of the latter both cerebral and cerebellar abscess were present but the diseased bone had reached both the middle and posterior fossae. Koerner says that the smaller the abscess the closer it lies to the brain surface.

Pathways of infection. In Friesner and Braun's series of 86 cases, all but one were of otitic origin.

Cases arising from acute otitis take a different route from those following chronic otitis. Friesner and Braun (3) quote Neumann who found that eight out of nineteen cases of cerebellar abscess in acute otitis had sinus thrombosis: six had epidural abscess in the posterior fossa and in one there was labyrinthitis. In four the pathway was not traced.

In their own series of fourteen cases, sinus thrombosis occurred in six, although in only one was a direct connection between the abscess and the sinus found macroscopically. They think this proportion too low. Epidural abscess was found in four and in only one was the labyrinth the route of infection. They say that only ten per cent. of the cases following acute otitis are labyrinthogenic while in the chronic otitides, 50 per cent. take this route; and they add, "When clinical examination shows symptoms of suppurative labyrinthitis, sinus thrombosis and cerebellar abscess, the pathway of infection is usually through

the saccus." In those cases complicating chronic otitis, they found suppuration of the labyrinth in 31 of 72 cases and they regard this as an underestimate.

Alexander (4) says that labyrinth suppuration occurs in 85 per cent. of all cerebellar abscesses developing during chronic middle ear suppuration.

These statistics warrant the following conclusions:

1. Brain abscess is a relatively rare complication of acute otitis.

2. Cerebellar abscess is still rarer, especially in children.

3. Most brain abscesses and by far the greatest number of cerebellar abscesses are direct sequels of suppurative disease in the temporal bone.

Symptoms and Diagnosis.

The classical subdivision of brain abscess is into four stages, but practically it is not always possible to recognize all these periods and in some cases signs of all four stages are absent and the diagnosis is made only at autopsy.

In any case, the first question to be solved is, "Is there an intracranial complication?"

Second, "What is its nature?"

Third, "If there is an abscess is it in the middle or posterior fossa?"

It is often a puzzling question to determine the presence of an intracranial complication. Especially is this true in young children, who, not infrequently, manifest cerebral symptoms which are cleared up by a prompt mastoid operation or even a paracentesis. In such cases, the indicated operation makes the diagnosis.

It is still more difficult sometimes to determine the nature of the intracranial lesion. One may see such meningeal symptoms as headache, high temperature (not necessarily of the pyemic type), cloudy cerebrospinal fluid under pressure and with a high cell count in sinus thrombosis, brain abscess or meningitis. If bacteria can be demonstrated in the fluid, of course, meningitis should be diagnosed. Sinus thrombosis with typical symptoms is readily recognized; but, on the one hand, these may be absent in thrombosis and, on the other hand, may be present in other intracranial infections, such as cerebellar abscess. A positive blood culture helps make the diagnosis but, if negative, may still leave one in the dark. It is only when pressure symptoms—slow pulse, choked disc, etc.—supervene that we can diagnose a room-

limiting process inside the skull. Given these signs, plus a moderately elevated temperature, a cloudy or clear cerebrospinal fluid under increased pressure and with an increased cell count but no bacteria, we are warranted in suspecting brain abscess.

When focal signs appear, it becomes possible to say whether the lesion is cerebral or cerebellar. In a case of suspected brain abscess following chronic otorrhea, the demonstration of labyrinth invasion would point to cerebellar location. Signs of brain abscess in acute otitis if accompanied or preceded by evidence of sinus thrombosis, also point to the cerebellum.

In cerebellar abscess, choked disc, headache, (especially if occipital) vomiting and rapid emaciation are much more frequent than in cerebral.

Vertigo, falling, ataxia, nystagmus and past pointing—in fact, all the signs revealed by an examination of the vestibular apparatus—are of great value in locating the abscess. It is true that labyrinthitis exhibits these signs but, a careful application of the Barany tests where possible, will give valuable aid in determining their source. Spontaneous vertigo, falling, nystagmus and past-pointing have different characteristics when dependent on infection of the labyrinth from those shown when they are due to cerebellar lesion only. In the former their intensity is greatest at the onset and quite rapidly diminishes—especially the nystagmus. If only a labyrinthitis is present, the direction of falling will be influenced by the position of the head, which is not true of cerebellar lesion. Likewise, the direction of the nystagmus may be different. Cerebellar nystagmus is apt to be horizontal instead of rotary.

If spontaneous vertical nystagmus is present, it always means central lesion. Diffuse labyrinthitis never produces vertical nystagmus.

Retention of hearing with vestibular signs point away from the labyrinth and towards central lesion.

If, after stimulating the internal ear by turning or douching, a perverted nystagmus or past-pointing is found, it means intracranial lesion.

The absence of vertigo after stimulation together with retention of good eye responses suggests cerebellum.

In those cases complicating chronic otorrhea, where the labyrinth involvement has been gradual or where it has occurred long previously and a dead labyrinth is present, the problem is more difficult. But, just the fact of finding a non-functioning labyrinth

coupled with vestibular signs, makes the diagnosis of a lesion in the posterior fossa probable. Furthermore, the vestibular examination will show that the falling and nystagmus is of the cerebellar type.

Neumann's (5) discussion of this matter is illuminating. It is known that in circumscribed labyrinthitis and also in cerebellar lesion, the nystagmus is towards the diseased side. Given a case where such a nystagmus is present, with the excitability of the labyrinth by cold douching present or absent but with the fistular and galvanic tests exciting nystagmus, it is not possible to say whether the signs are from a lesion of the end organ or in the posterior fossa, before a labyrinth operation is done. Neumann advises doing the labyrinth operation in such a case, after which, if the spontaneous nystagmus is due to the labyrinth, its direction is changed to the sound side; if from intracranial lesion it remains as before the operation.

Again, if there is nystagmus towards the diseased side and the labyrinth is not excitable by any kind of stimulation, it must be caused by a lesion in the posterior fossa.

Still again, if there is nystagmus to the sound side and stimulation of the labyrinth does not produce responses, the labyrinth operation must be done before a diagnosis can be made. If the nystagmus in the case cited is labyrinthine, it vanishes in a few days but if from cerebellum, it remains or increases in intensity and may reverse its direction and be toward the diseased side.

Prognosis and Treatment.

The unoperated cases all die. Of the operated cases, statistics show 25% to 50% recoveries, which figures, as Braun and Friesner say, are probably too high, as there is a tendency to report only successful cases.

The time to operate is when an intracranial lesion is suspected with reasonable certainty.

Experience has shown that the approach through the mastoid offers by far the best outlook.

Exploration through the lateral sinus wall, first obliterating the sinus as suggested by Ballance, Eagleton and Braun and Friesner, affords a very favorable route to the abscess.

Judging from the outcome in the cases of so-called stalk abscess, where adhesions between dura and pia have already formed, the method of Le Maitre (6) or the performance of the operation in two stages several days apart would seem to be more likely to

prevent infection of the meninges. If dural adhesions have already formed, the knife is the preferable exploring instrument.

The abscess having been found, free and continuous drainage by tube is essential. As little manipulation of the brain as possible by instruments or finger is essential as cerebellar tissue tolerates handling badly.

Dressings should be frequent and stasis rigorously prevented.

Bed rest is imperative.

Le Maitre's technique is briefly as follows:

1. Meninges exposed but not incised.

2. Stout Pravaz needle pushed through dura and into the brain until the abscess is found and pus runs out through needle.

3. When pus appears, needle is replaced by a grooved director.

4. Small (filiform) drain introduced along the groove of director.

5. In 24 to 48 hours, this drain is replaced by a larger one, slightly enlarging the hole if necessary but not going beyond the area of inflammatory adhesions formed by the irritation of the drain. The drain is replaced daily by a larger one each time until a tube six or seven millimetres is employed.

* * * * * * * *

At a meeting of the New York Otological Society on January 27th, 1920, Kerrison (7) reported a case of cerebellar abscess complicating acute mastoiditis which is very instructive and which had typical symptoms.

The child was fourteen years old and came in with a history of acute purulent otitis media of the right side of two weeks' duration. At the time of examination the temperature was 98.6°, pulse 63; nystagmus was present, most pronounced to the right on looking toward the right; inco-ordination ataxia of the right hand; past-pointing to the right with the right hand; diadokokinesis of the right hand; tendency to fall to the right; eye grounds normal. A simple mastoidectomy was done, which revealed only moderately extensive disease.

Following the operation, the general condition was good, very little headache, mentally clear, no insomnia but such a number of focal symptoms that the diagnosis of cerebellar abscess was certain. Owing to the good general condition of the patient, exploration of the brain was deferred for a few days but one night the child suddenly died. Post mortem was refused but the posterior fossa was opened and on inserting a knife the abscess was found.

CASE REPORT.

The case I have to report is an uncomplicated cerebellar abscess following acute otitis media in a child.

Alice A., two years old, a healthy, well nourished child with a negative family history, became acutely ill on January 30th with a convulsion and temperature of 105.4°; sore throat and bilateral cervical adenitis. Her attendant, Dr. Stevens, diagnosed influenza. The fever continued high and on February 1st earache developed, first in the right ear and then in the left. I saw the case on the evening of this date and did a paracentesis on the right ear. The next morning the temperature was 101° but by evening it had again reached 104.6°, and the left membrane was incised. Discharge was free from both ears and the temperature again dropped to 101°.

Feb. 5th. Blood count: Red blood cells 4,800,000, Leucocytes 15,000; Polymorphonuclears, 67%; Mononuclears, 6%; Hemoglobin, 85%.

7th (9th day). The temperature suddenly rose from 100.4° to 104.4°, returning to normal in twelve hours; rising again on the 8th to 102° and on the next day going from 99.4° to 104.4°. Both mastoids tender.

9th (11th day). Mastoidectomy both sides. On the right the sinus was exposed over a small area; mastoid full of granulations, no macroscopic pus. The left mastoid contained pus. Cultures from the right, no growth; from the left, streptococcus. Following the operation, the patient's condition was only slightly improved.

13th (15th day). Pain in left ear and a rash on the arms and legs; patient wakened suddenly and cried out.

14th (16th day). First dressing: both wounds clean with very little secretion.

18th (20th day). The temperature has varied between 100° and 102° until today when it is 103.4° for one observation.

27th (29th day). Temperature has been about 100°, varying between this point and 97°. During the previous night was very restless and on the afternoon of this day the temperature rose to 102.6°, gradually coming down until the normal point was reached on

March 2nd (33rd day). General condition excellent.

3rd (34th day). Temperature 102.4°; very irritable; considerable pus in the right wound noted at the dressing.

4th (35th day). Cried several times during the night; morning temperature, 102.4°; afternoon, 104.4°. Some flabby granulations removed from right antrum but no necrosis of bone found; small adenoid removed. Following this operation, temperature 99°.

8th (39th day. Right ear discharging considerable pus; drowsy; bad night; small emesis; temperature 103.4°.

9th (40th day). White blood count, 12,000; urine, trace of albumen and large numbers of bacteria. Temperature, 100.4°.

12th (43rd day). The temperature continues moderately elevated, less than 100° for past two days; copious discharge from right ear; left ear dry; very irritable.

16th (47th day). Temperature reached 104.8°.

17th (48th day). Right abducens paresis. Lumbar puncture: fluid clear, tension increased, 200 cells to cem., mostly polys, culture and smears negative; spinal Wassermann weakly positive. Blood culture, sterile after 46 hours.

19th (50th day). A. M. temperature, 98.2 ; P. M., 104 at four and 99.2° at eight.

20th (51st day). Morning temperature 97 —highest 98.4 . White blood count: 10,000; polys, 47%.

22nd (53rd day). Temperature 103.8°; irritable; nails blue.

23rd (54th day). Consultation with Drs. Carmody, Mullin and Stevens. On right side the dura over the tegmen antri and tympani was exposed for one and a half inches and lifted up as far as almost to the internal auditory meatus; no epidural abscess, dura appears healthy. Lateral sinus exposed and found healthy. Owing to the type of temperature, it was decided to open the sinus which was done and no thrombosis found—free bleeding from both directions. Exploration of the brain was discussed and thought not advisable.

26th (57th day). Temperature has been remittent in type, reaching a maximum of 104.4 . Headache; irritable; no secretion in wound or ear.

28th (59th day). Temperature very irregular; restless; poor appetite.

29th (60th day). Temperature 104.8°; refuses food; light seems to hurt eyes; irritable, pulls blanket over head when spoken to.

30th (61st day). Morning temperature, 99.2°; P. M., 105.2°. Food refused.

31st (62nd day). Awakened suddenly crying. Temperature curve shows rather sharp remissions for past five days.

April 11th (73rd day). General condition has been better and the temperature only moderately elevated until today when it has remained above 102°. Projectile vomiting. Further operative measures prohibited.

14th (76th day). Vomited; temperature not over 100° since the 11th.

15th (77th day). Both eyes turned to left; horizontal nystagmus to the right on looking towards the right. Temperature 99°.

18th (80th day). Temperature has ranged from 97° to 99°; right eye turned up, left down; ataxia of the right arm; sighing respiration; pulse 100, dropping to 60; seems to be in pain.

19th (81st day). Unconscious; convulsion; slight cries; moves arms and legs; Cheyne-Stokes respiration—10 to 20 per minute; pulse 60; knee jerks increased; double Babinski; rotary nystagmus; feels pin pricks in arms, legs and face.

20th (83rd days). Semi-conscious; divergent strabismus; pulse 120, then 66; temperature remains low.

22nd (85th day). Conscious; pulse 160; respiration 24; temperature 98.6 . Irrigation of right ear with cold water (68°) produces no nystagmus in any position of the head, after five minutes douching.

28th (90th day). Temperature practically normal; convulsion; retching; weak, slow, irregular pulse; irregular and slow respiration for the past six days. Vertical nystagmus. On this day the temperature began to rise and from then till death, nine days later, was of a septic type, varying from 98.4 to 103 and 104 daily; pulse very irregular and variable, a rate of 160 alternating with one of 60. Respirations dropped to 8 per minute. For two weeks it was impossible to give any nourishment whatever and the patient wasted to a shadow. The tenacity of life was remarkable.

The postmortem revealed an abscess occupying the entire right cerebellum, the brain tissue being reduced to a shell. The cavity contained about four ounces of thick greenish pus; smears showed short-chain streptococci. No meningitis, thrombosis or other signs of intracranial involvement were found. The right labyrinth was macroscopically normal.

COMMENT.

It would be instructive to know just when the symptoms of abscess began. Was it on the 48th day of the illness when the abducens paresis was first noted? According to Alexander (4) sixth nerve paralysis is an important sign of cerebellar abscess. He says, "A cerebellar sign of great importance consists of abducens paralysis or paresis." Again, "The transition of the latent stage into the acute stage is usually shown by double vision or abducens paralysis." If the latter quotation is true, it must have developed before that date and have already passed through the first two stages. However, this is not an uncommon sign in many other otitic complications and it seems that one would not be justified in giving it the weight he does.

The things which speak against abscess were:

1. The rarity of cerebellar abscess as a complication of acute otitis in young children. Meningitis is much more frequently encountered.
2. The high and pyemic type of temperature. In brain abscess the temperature is usually normal or only slightly elevated. This sign pointed more to sinus thrombosis or meningitis.
3. The absence of localizing signs until comparatively late in the case, unless we regard the abducens paresis as a sign of cerebellar abscess. It was not till April 15th that nystagmus toward the diseased side appeared.

The points in favor of abscess were:

1. Abducens paresis. (Alexander).
2. Projectile vomiting, slow pulse, etc. (These came late).
3. Nystagmus toward the diseased side with absence of responses to the caloric test.
4. Sterile cerebrospinal fluid with increased cell count.
5. Ataxia.
6. Failure to find adequate cause for the symptoms at the exploratory operation on March 23rd.

By the time the spontaneous nystagmus and the ataxia became evident our minds were made up as to the diagnosis. The spinal fluid findings offered a clew but, taken in connection with the temperature, were thought to be more indicative of thrombosis, extradural abscess or circumscribed meningitis.

Had an exploration of the cerebellum been made on March 23rd, or within the next few days, we might have been fortunate enough to discover the abscess. This procedure was discussed and decided against because of the lack of signs definite enough to warrant it. At that time, the strongest argument in favor of abscess was the fact that the operation itself had ruled out practically all other intracranial complications. Alexander (4) says, "An experienced surgeon will then be led by the operative findings of the labyrinth, dura or sigmoid sinus, to proceed to the cerebellum and evacuate the abscess." The inference here is that the surgeon has found at the exploratory operation some condition of the dura, sinus or labyrinth to confirm his suspicions. We

did not find such condition. A little later, consent for further operative interference was withheld, the father saying that even if an abscess were found and the patient recovered, he felt that she would never be right mentally.

It was not till the twentieth day of the illness that the temperature showed signs of declining, and this was for a few days only. It soon rose again and exhibited such sharp rises and falls that a strong suspicion of thrombosis, meningitis or extradural abscess was aroused. These complications are very much more frequent in acute otitis than abscess, especially in children.

On the 73rd day projectile vomiting appeared and was repeated three days later, and when on the 77th day there was a horizontal nystagmus to the diseased side, there was no more doubt of the diagnosis.

A perfect example of ataxia of the right arm was noted three days later. Next, the fact was established that no responses could be obtained from stimulating the right vestibular apparatus.

The pathway of infection is not known. It certainly was not by way of a perisinous abscess or sinus thrombosis. The fact that there was no response from the right vestibular apparatus would suggest a labyrinthine route except that there were no previous vestibular or cochlear symptoms and no sign of labyrinthine involvement found at the post mortem.

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ROENTGENOLOGY OF THE MASTOID WITH CONCLUSIONS BASED ON ONE HUNDRED CASES.

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The difficulties of obtaining accurate radiographic knowledge of the mastoids have been many. However, these have been largely overcome, in the past few years, by improved positions for both the patient and the tube, so that the work of the roentgenologists have greatly facilitated an accurate diagnosis. In fact, almost every case should be submitted to an X-ray examination of the right and left mastoid prior to operation.

Any study of radiograms of the mastoids is of very little value unless one realizes what should be seen not only in the normal, but in the abnormal. Iglauer[1], Lange[2], Birkett[3], Pirie[4] and others have all been pioneers in this field of otology and have worked with the roentgenologist. It has been their untiring efforts which have made this work of practical value in the diagnosis of mastoiditis, especially of the acute type. More recently a very valuable article has appeared by Bigelow[5] from which I shall quote freely.

Whiting[6] has emphasized the importance of looking for the lateral sinus wall forward in a long and narrow mastoid process while operating. Conversely it lies far back, as a rule, in a wide process. The pneumatic and diploic types have long been recognized anatomically, and surgically, as well as a combination of these two. Theoretically a pneumatic mastoid should be the easiest to examine by X-ray. However, a very thick cortex over all or most of the cells, may increase the difficulty of recognizing the individual cell structure; thus making the process look a trifle cloudy, when in reality it is clear. Conversely a thin cortex may give a rather clear radiogram when the cells are at least slightly diseased. It is almost needless to state that with extensive necrosis, granulations, and pus throughout the mastoid, there should be very little difficulty in obtaining a radiogram which will show the extensive destruction. However, it is not a case, with such marked involvement, in which the X-ray is most needed, as an aid in diagnosis but a case in which the clinical evidences are less pronounced.

In the diploetic type a thick cortex is almost certain to give a slight suggestion of haziness even when the cells are normal. Therefore, the roentgenologist can state only what he finds, and his report, like those from the other laboratories, must be weighed and compared with all the rest of the clinical evidence, before deciding for or against operation. In spite of this fact, Bigelow[7] very properly says, "The X-ray is our best consultant," or words to that effect; and, "When in doubt, radiograph: if still in doubt, operate." If his advice is followed there will be fewer exploratory mastoidectomies required, because the X-ray affords one of the best means of determining what changes are taking place in the mastoid process.

If the lateral sinus is well forward, where it may be unintentionally opened, the radiogram will usually show this. However, if well covered with dense cortex, necrotic cells, granulations and pus, it is almost impossible to detect its bony groove. The X-ray differentiates densities, so that if all is very dense in the mastoid process the details are lost.

Cheatle[7, 8, 9, 10] has written extensively upon the mastoid anatomically and he has the following to say: "I apply the term 'infantile' to those bones which retain throughout life the characteristics of the outer antral wall and the mastoid mass as seen in infancy. On making a lateral vertical section through the antrum and the mastoid mass in infancy, it will be seen that the outer wall of the antrum is composed of two layers: a thin outer layer of compact bone; and, an inner layer of fine cells. These cells are formed before birth, therefore I call them the 'fetal cells' to distinguish them from any which may form in later life and from which they can be differentiated always by their fineness and inward direction. The mastoid mass is as a rule diploetic, but it may be formed of dense bone. If the mass is diploetic, a thin layer of compact bone, which can be easily demonstrated by scraping away the diploe, separates it from the antral cavity. There are therefore two types in infancy: one in which the mastoid mass is diploetic; and, one in which the mastoid mass is dense. Each type may persist all through life, but of course, on an exaggerated scale."

Type 1. "The diploetic type in the adult. In this type the thin outer compact layer of the antral wall has increased in thickness from the periosteal side and is of extreme density; the inner, layer of 'fetal cells' is still seen; the mastoid mass is entirely diploetic and the separating layer between the diploe and the

cavity of the antrum is much increased in thickness. Whenever the mastoid process is entirely diploetic the outer antral wall is always formed of dense bone. This type is seen in about twenty per cent. of all bones, and it can be seen at all ages.

Type 2. The dense form in the adult. In this type the dense mastoid mass persists all through life, but the outer antral wall remains the same as in the diploetic type, the outer layer being very much increased in thickness and of extreme density, while the inner layer of 'fetal cells' is still seen. This form is seen in only about one or two per cent. of all bones.

The outer antral wall is often of great thickness as well as density in these infantile types. The greatest depth of antrum from the surface is seen in them and it may measure ¾ of an inch (19 m.m.). A forward lateral sinus is usual and is found much more frequently and to a much greater extent than in the cellular types. The sinus often comes well forward below the level of the antrum and may reach the posterior meatal wall, or it may even dip in between the cavity of the antrum and the surface. The antrum may be large or small; if large, the posterior wall may be of extreme thinness and translucency, and may have either the cerebellum or lateral sinus, or both, lying against it. In some specimens the posterior antral wall is pushed in by the cerebellum thus narrowing the antral cavity from before backward. As in all types, the antrum may be highly placed, or the middle fossa may dip down either between the antral cavity and the surface or external to the superior semicircular canal, causing a low flat antrum."

If the otologist will bear in mind Cheatle's classification, while studying the radiogram and while operating, there will be less opportunity for errors in interpretation.

Iglauer[1], in 1909, advocated taking the radiogram at an oblique angle, in order to avoid the dense bone at the base of the skull, which in the horizontal plane would be superimposed. To quote him exactly, he has the following to say: "The radiograms were taken in an oblique profile, i. e., the rays coming from the target were made to center just below the parietal eminence on one side of the skull and were directed through the cranium in the direction of the temporal bone on the opposite side of the skull. At this angle the best skiagrams were obtained. In this position Dr. Lange found that the axis of the X-ray diaphragm was tilted upward at an angle of 25 degrees from the base of the skull (Reid's line) and that it was inclined backward 20 degrees from

the vertical plane passing through both external auditory canals."

While Iglauer's technic is a very desirable one to follow this position can be varied slightly by different technicians and yet give satisfactory results. The important things to remember are as follows:

1. The dense bones at the base of the skull are not superimposed upon the mastoid.

2. The mastoid rests directly against the film or negative when the exposure is made, thus insuring more accurate detail in the radiogram.

I believe the method described and advocated by Iglauer in 1909, or some modification of this, will probably give the best exposure with the least likelihood of faulty interpretation. However, this does not permit the taking of stereoscopic plates.

I have often noticed a very good picture of the tip cells in stereoscopic radiograms of the accessory sinuses taken anteroposteriorly, especially in certain types of wide skulls. However, this exposes only a very limited portion of the mastoids. This position was utilized by Kuhne[12] and Plagemann[13] in 1908 in their efforts to secure a satisfactory exposure. Voss[14] and Winkler[15] used the transverse position in 1907.

Stereoscopic radiograms of the accessory sinuses, taken laterally, often show the mastoids very clearly. However, I cannot recommend this method in preference to Iglauer's.

Ingersoll[16] has emphasized the differentiation, which a good mastoid radiogram gives, between slight involvement of the cells and areas of necrosis with destruction of bone and also the absence of involvement of the tip cells in a sclerosed mastoid prior to a radical operation. Hence the necessity of not opening the tip. He believes in acute cases, of the pneumatic type, with areas of necrosis showing, we should operate early, and bases this opinion on the radiographic findings.

Bigelow[5] believes a radiogram will, in most instances, help us at least to detect what the Harvard otologists call a "double decked" mastoid, which consists of two strata of cells separated by a bony partition more or less completely dividing the process into two parts. With a well taken radiogram the deeper cells are less apt to be overlooked at the time of operation.

One is usually able to recognize the following: The external auditory meatus, the mastoid antrum, the internal auditory meatus, the lower boundary of the middle cranial fossa, and sometimes the groove for the lateral sinus, as well as the bound-

ary of the posterior cranial fossa. If the tip cells are large these can be more easily seen than the smaller and higher cells.

As otologists we are especially anxious to know in what per cent of the cases the roentgenographic findings are corroborated at the time of operation. With this question in mind I examined the X-ray reports of 100 cases of mastoiditis in the Ear, Nose and Throat Clinic at the Base Hospital, Camp Lewis, Washington. Of this number fully 80% confirmed the X-ray findings at the time of operation. In many of the case records either the X-ray or operative findings or both were very briefly or even incompletely written down. All of these indefinite or doubtful cases are included in the 20%. I believe if the notes had been complete for all of the 100 cases that the X-ray findings would have been confirmed by operation in more than 80%.

Are not these figures conclusive evidence of the value of an accurately taken radiogram? Are other lines of laboratory diagnosis apt to yield a higher percentage of aid in making the complete diagnosis? I am not advocating too great dependence upon roentgenographic findings, especially to the exclusion of other methods of diagnosis, but I do believe the X-rays are a valuable aid and as such I expect to use them in the future more than in the past.

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SOME OBSERVATIONS ON PALATE SURGERY.

By THOMAS E. CARMODY, M. D., Denver, Colo.

The thought which first occurs to us when palate surgery is mentioned is that of congenital cleft palate. However, this may be to the experienced in this line of surgery, the uninitiated, or those of small experience think of the classical operations mentioned and illustrated in our text books and papers. We wish, however, to devote our attention to the complicated conditions following partial or complete failures in these operations, and also deformities of the palate due to faulty technique or absolute ignorance of surgical conditions or principles, and to the performance of operations in regions contiguous to the palate.

It has been our fortune to encounter many cases of cleft palate, operated by unskilled operators, with more or less complete failure, but we have seen the same happen after apparently skillful performance of the operation, and in viewing the remains, it is difficult to say which has been the case, as in both, infection has probably played an important role.

The difficulties involved in these cases of secondary operation are about the same, whether the failure be that of some other operator or ourselves.

Another class of cases which ought never to occur is the result of injury to both the posterior wall of the pharynx and the nasal surface of the palate, together with the pharyngeal surface of the posterior pillars, allowing the adhesion of the palate to the pharyngeal wall. All the cases of the latter variety have been due to prolonged and unskilled manipulations at the hands of operators, who, apparently did not know which tissue they wished to remove and were probably no more skilled in diagnosis than in surgery. Besides, we may see conditions akin to this following diphtheria, and the acute exanthema, as well as syphilis. No account is taken of those minor injuries due to too generous use of adenoid curets, causing partial adhesions which are easily broken.

The resulting conditions in these two classes are almost the direct opposite. The former results in a short or incomplete palate, while the latter results in either a stenosis or complete atresia of the nasopharyngeal passage. The difficulties of repair

are about equal. The chances for success are in direct proportion to the perserverance and patience of both operator and patient.

We shall not weary you with a recital of the various methods and operations used in simple cleft palate and the generally associated hare-lip. It is, however, quite necessary to give in some detail the reasons for failure which are most common, and the different ways in which we at times court failure.

First. The physical condition of the patient should be the best possible to secure under the circumstances. By this statement we mean that in certain cases, especially in babies, it may be necessary to operate in the face of constantly lowering vitality, although this probably applies more to lip than palate operations.

Second. It is just as necessary to attain and preserve asepsis as in any other operation—notwithstanding statements to the contrary. While this assertion may be challenged on the ground that the mouth contains all varieties of bacteria present in the body and that we are unable to obtain complete asepsis, the patient may not be immune to many bacteria present, should such be introduced through a wound into the tissues, and we surely should not introduce a strain of any variety not present. It is not possible to procure perfect asepsis in or on the body at any point.

Third. Tissues must be thoroughly freed from their original attachments and placed in their new positions without tension. Furthermore, this must be accomplished without serious interference with the nutrition of the flaps. The flaps should be of sufficient thickness to make a strong but pliable palate. Edges must be freshened by removing tissue, especially scar tissue, or by splitting the thick soft palate.

Fourth. Sutures must be so placed, if possible, that muscles will be united in normal position, to avoid puckering. To this end and to prevent cutting out of sutures by drawing too tightly, we have used the continuous suture suggested first by Kirk. Sutures should not be too closely placed. It may be advisable or even necessary to suture both oral and nasal surfaces.

Fifth. A well trained assistant and anesthetist, good light, a suction apparatus, preferably combined with warmed ether apparatus, are all quite necessary to success. The position of the patient should be a semi Trendelenberg, as this helps to prevent the aspiration of blood. All clots should be removed before the patient leaves the table, either by suction, or by washing nose, mouth, and throat with a saturated solution of boric acid. This

boric solution also controls slight oozing. I have used this latter with marked success in tonsil and adenoid operations as in the above cases for a number of years, and without bad results. If the above have been carried out thoroughly, very little is to be feared, but there still remain a few pitfalls for the unwary.

Sixth. A good nurse who understands what you are trying to accomplish, plenty of water and for small children, half strength food to avoid the danger of acidosis from starvation, and to prevent the restlessness and crying due to starvation—all of these are essential for good results. Irrigate with glucose and soda the day before and within four hours following operation and keep the bowels open.

Seventh. Irrigate the mouth with soda solution and touch ulcerating spots with 20% silvol once daily.

Eighth. Watch carefully for the onset of acute bronchitis which may develop into pneumonia, and equally important, watch for an acute otitis. These may be guarded against by preventing the patient from assuming and continuing one position. The use of metal mittens will prevent the child from getting the fingers into the mouth.

Ninth. Keep the parents away from the child, or at least do not let the child see the parents. Many bad results can be laid at mother's door.

If failure results after an operation when all precautions have been taken,—infection, which may be unavoidable, is probably the cause. When such is the case, or if failure results from other causes, secondary operation should be delayed until healing takes place, as infection lurks in many folds and crevices.

In this operation all scar tissue should be removed, as it is of low vitality and will not heal rapidly and is, furthermore, not pliable. It is hard to penetrate with a needle and yet, tears out easily.

Large openings in the palate, anteriorally, may be closed by inserting a portion of the anterior and of the inferior turbinate,—first detaching membrane partially but leaving sufficient attachment for nourishment; after blood supply is established, the pedicle can be detached and sutured to opposite side of opening. This has been done successfully by Dr. Joseph C. Beck and the author. Another method used by us for small openings, is the dissection of flaps from the nasal surface on one side and the oral surface on the other side, after the manner of Lane's operation. (Berry, Legg and Godyer).

It must be borne in mind that many openings left following partial closures, may close partially or completely if left, while too early secondary operation may leave a larger opening.

While it is difficult to obtain healing in cleft palate, it is difficult to prevent union of the palate and pharyngeal tissues in cases of adhesions in this region, and it becomes necessary to interpose epithelium between these tissues to prevent union. This is done either by sliding flaps of the palate from the oral surface around onto the nasal surface and posterior edge, or by tucking mucous membrane from the cheek or anterior pillar, if present, through an opening in the posterior pillar. Skin transplants have not been successful in my hands.

AMERICAN LARYNGOLOGICAL, RHINOLOGICAL AND OTOLOGICAL SOCIETY, INC.

MINUTES.

The Twenty-seventh Annual Meeting of the American Laryngolical, Rhinological and Otological Society, Inc., was held at the Hotel Chelsea, Atlantic City, New Jersey, on June 3rd and 4th, 1921.

The President, Dr. Lee Wallace Dean, presided.

The following Fellows registered during the session:

DR. JOS. H. ABRAHAM.....New York City
DR. LAWRENCE DADE ALEXANDER.....New York City
DR. HUBERT ARROWSMITH .....Brooklyn, N. Y.
DR. JOSEPH C. BECK.....Chicago, Ill.
DR. F. NOLTON BIGELOW.....Providence, R. I.
DR. H. S. BIRKETT.....Montreal, Canada
DR. WESLEY C. BOWERS.....New York City
DR. W. C. BRAISLIN.....Brooklyn, N. Y.
DR. ALFRED BRAUN .....New York City
DR. H. H. BRIGGS.....Asheville, N. C.
DR. JOHN E. BROWN.....Columbus, Ohio
DR. SETH A BRUMM.....Philadelphia, Pa.
DR. LOUIS J. BURNS.....Philadelphia, Pa.
DR. R. BISHOP CANFIELD.....Ann Harbor, Mich.
DR. THOS. E. CARMODY.....Denver, Colo.
DR. WILLIAM WESLEY CARTER.....New York City
DR. WILLIAM B. CHAMBERLIN.....Cleveland, Ohio
DR. GEORGE M. COATES.....Philadelphia, Pa.
DR. LEWIS A. COFFIN.....New York City
DR. LEE COHEN .....Baltimore, Md.
DR. B. N COLVER.....Battle Creek, Mich.
DR. CHARLES N. COX.....Brooklyn, N. Y.
DR. FRANKLIN E. CUTLER.....Cleveland, Ohio
DR. EWING W. DAY.....Pittsburgh, Pa.
DR. LEE WALLACE DEAN.....Iowa City, Iowa
DR. EDWARD B. DENCH.....New York City
DR. JESSE W. DOWNEY.....Baltimore, Md.
DR. ARTHUR B. DUEL.....New York City
DR. J. DWORETZKY .....Liberty, N. Y.
DR. WELLS P. EAGLETON.....Newark, N. J.
DR. JOSHUA A. ELLEGOOD.....Wilmington, Del.
DR. FRANCIS P. EMERSON.....Boston, Mass.

DR. CURTIS C. EVES.....Philadelphia, Pa.
DR. JOHN F. FAIRBAIRN.....Buffalo, N. Y.
DR. THOMAS H. FARRELL.....Utica, N. Y.
DR. GEORGE FETTEROLF .....Philadelphia, Pa.
DR. EDMOND P. FOWLER.....New York, N. Y.
DR. IRA FRANK .....Chicago, Ill.
DR. ISIDORE FRIESNER .....New York City
DR. T. E. FULLER.....Texarkana, Ark.
DR. MAX A. GOLDSTEIN.....St. Louis, Mo.
DR. CHARLES P. GRAYSON.....Philadelphia, Pa.
DR. J. B. GREGG.....Sioux Falls, So. Dak.
DR. JAMES S. GREENE.....New York City
DR. JOS. BERRY GREENE.....Asheville, N. C.
DR. J. H. GUNTZER.....New York City
DR. THOMAS H. HALSTED.....Syracuse, N. Y.
DR. THOMAS H. HARRIS.....New York City
DR. WILLIAM H. HASKIN.....New York City
DR. HILL HASTINGS .....Los Angeles, Cal.
DR. HAROLD HAYS .....New York City
DR. F. T. HILL.....Waterville, Me.
DR. E. V. HUBBARD.....New York City
DR. LESTER MEAD HUBBY.....New York City
DR. LEE M. HURD .... New York City
DR. SAMUEL IGLAUER .....Cincinnati, Ohio
DR. CHARLES J. IMPERATORI.....New York City
DR. JOHN M. INGERSOLL.....Cleveland, Ohio
DR. F. L. JACK.....Boston, Mass.
DR. CHEVALIER JACKSON .....Philadelphia, Pa.
DR. J. W. JERVEY.....Greenville, S. C.
DR. CHARLES C. JONES.....Cincinnati, Ohio
DR. GEORGE F. KEIPER.....Lafayette, Ind.
DR. PHILLIP D. KERRISON.....New York City
DR. D. A. KUYK.....Richmond, Va.
DR. M. D. LEDERMAN.....New York City
DR. FIELDING O. LEWIS.....Philadelphia, Pa.
DR. H. W. LOEB.....St. Louis, Mo.
DR. JAMES E. LOGAN.....Kansas City, Mo.
DR. ROBERT LIVINGSTON .....New York City
DR. H. W. LYMAN.....St. Louis, Mo.
DR. HENRY LOWNDES LYNAH.....New York City
DR. JOHN EDMUND MacKENTY.....New York City
DR. GEORGE W. McKENZIE.....Philadelphia, Pa.
DR. WILLIAM BEVERLEY MASON.....Washington, D. C.
DR. JAMES F. McCAW.....Watertown, N. Y.
DR. JAMES F. McKERNON.....New York City
DR. O. A. M. McKIMMIE.....Washington, D. C.
DR. RICHARD McKINNEY .....Memphis, Tenn.
DR. LEONIDAS L. MIAL.....Morristown, N. J.
DR. CLIFTON M. MILLER.....'.....Richmond, Va.

DR. ROBERT MILLIGAN ..... Pittsburgh, Pa.
DR. THOMAS W. MOORE..... Huntington, W. Va.
DR. HARRIS P. MOSHER ..... Boston, Mass.
DR. WILLIAM V. MULLIN..... Colorado Springs, Colo
DR. JOHN W. MURPHY..... Cincinnati, Ohio
DR. GILBERT D. MURRAY..... Scranton, Pa.
DR. SEYMOUR OPPENHEIMER ..... New York City
DR. FRANCIS R. PACKARD..... Philadelphia, Pa.
DR. LaFAYETTE PAGE ..... Indianapolis, Ind.
DR. WENDELL C. PHILLIPS..... New York City
DR. NORVAL H. PIERCE..... Chicago, Ill.
DR. ANDREW J. N. REIK..... Baltimore, Md.
DR. HENRY O. REIK..... Baltimore, Md.
DR. GEORGE L. RICHARDS..... Fall River, Mass.
DR. CHARLES W. RICHARDSON ..... Washington, D. C.
DR. JOHN A. ROBINSON ..... New York City
DR. CHARLES M. ROBERTSON..... Chicago, Ill.
DR. DUNBAR ROY ..... Atlanta, Ga.
DR. WILLIAM E. SAUER..... St. Louis, Mo.
DR. RUFUS B. SCARLETT..... Trenton, N. J.
DR. L. A. SCHIPPER..... Bismarck, No. Dak.
DR. G. A. SHARRETT..... Cumberland, Md.
DR. WARREN S. SHATTUCK..... Brooklyn, N. Y.
DR. B. R. SHURLEY..... Detroit, Mich.
DR. ROSS HALL SKILLERN..... Philadelphia, Pa.
DR. GREENFIELD SLUDER ..... St. Louis, Mo.
DR. HARMON SMITH ..... Portland, Me.
DR. S. MacCUEN SMITH..... Philadelphia, Pa.
DR. HERBERT E. SMYTH..... Bridgeport, Conn.
DR. R. SONNENSCHEIN ..... Chicago, Ill.
DR. FREDERICK N. SPERRY..... New Haven, Conn.
DR. EDGAR J. STEIN..... Lancaster, Pa.
DR. J. A. STUCKY..... Lexington, Ky.
DR. JOHN JAMES SULLIVAN, JR..... Scranton, Pa.
DR. JOHN J. THOMSON..... Mt. Vernon, N. Y.
DR. GEO. L. TOBEY, JR..... Boston, Mass.
DR. ANTOINE P. VOISLAWSKY..... New York City
DR. N. S. WEINBERGER..... Sayre, Pa.
DR. D. H. WALKER..... Boston, Mass.
DR. FRANCIS W. WHITE..... New York City
DR. LEON E. WHITE..... Boston, Mass.
DR. JOSEPH A. WHITE..... Richmond, Va.
DR. J. GORDON WILSON..... Chicago, Ill.
DR. D. J. GIBB WISHART..... Toronto, Can.
DR. GEORGE B. WOOD..... Philadelphia, Pa.
DR. THOMAS C. WORTHINGTON..... Baltimore, Md.
DR. SIDNEY YANKAUER ..... New York City

EXECUTIVE SESSION

June 3, 1921.

The President appointed Dr. Thomas J. Harris, Dr. F. P. Emerson, Dr. Norval H. Pierce, Dr. E. B. Dench, Dr. R. McKinney to constitute the Nominating Committee.

He also appointed Dr. Thomas E. Carmody, Dr. George F. Keiper, and Dr. D. J. Gibb Wishart to act as the Auditing Committee.

The following official guests were present:

Professor D. C. Miller,
Professor A. T. Blair,
Mr. A. B. Paine,
Mr. C. C. Bunch.

Election of Fellows:

DR. JULIUS DWORETZKY .....Liberty, N. Y.
DR. CALVIN A. FAUNCE, JR.....Boston, Mass.
DR. T. E. FULLER.....Texarkana, Ark.
DR. J. B. GREGG.....Sioux Falls, So. Dak.
DR. J. C. KEELER.....Philadelphia, Pa.
DR. H. I. LILLIE.....Rochester, Minn.
DR. J. L. MAYBAUM.....New York City
DR. L. A. SCHIPFER .....Bismarck, No. Dak.
DR. GRANT SELFRIDGE .....San Francisco, Cal.
DR. G. O. SHARRETT.....Cumberland, Md.
DR. ROBERT SONNENSCHEIN .....Chicago, Ill.
DR. G. L. TOBEY, JR.....Boston, Mass.
DR. D. H. WALKER.....Boston, Mass.
DR. N. S. WEINBERGER.....Sayre, Pa.
DR. J. GORDON WILSON.....Chicago, Ill.

REPORT OF SECTION MEETINGS.

Report of the Eastern Section:

The Eastern Section held its annual meeting at the Manhattan Eye, Ear and Throat Hospital, New York City, Saturday, February 26th, 1921. There were present about 80 members and 50 guests.

The Chairman of the Section endeavored to present a clinical symposium upon different subjects of immediate interest to our specialty. The first subject for presentation was "Foreign Bodies of unusual interest removed from Trachea, Lungs and Oesopha-

gus." Those contributing to this section were: Doctors Craig, Kernan, Lynah, Wilson and Francis White.

By request of the chairman, Doctor Morgan, of Montreal, presented a new instrument of his own, which enables the observer to detect foreign bodies in the lungs in fluoroscopic examinations, obtaining both anterior and lateral views at the same time. Doctor Birkett confirmed the advantages of this instrument and declared it to be a great advance as well as a great aid in removing foreign bodies within the chest wall.

The second series of reports was the "Diagnosis and Treatment of Laryngeal, Tracheal and Bronchial Diseases by Means of the Bronchoscope."

Doctor Imperatori, Stricture of Oesophagus; Dr. Lynah, Pulmonary Abscess; Dr. John McCoy, Asthma; and Dr. Yankauer, Whooping Cough.

Under the third heading—"Reports of Cases Beyond the Aid of Endoscopy," Dr. Chevalier Jackson presented a short paper entitled "Are there Cases of Foreign Bodies in the Lung impossible of Bronchoscopic Removal?"

The fourth subject was—"Malignant Neoplasms of Nose and Throat treated by Radium." Under this heading Doctor Douglas Quick of New York City presented by invitation eight cases showing various results from the application of radium in malignant diseases of the upper respiratory tract. Others reporting upon this subject were: Doctors Culbert, Forbes, Freudenthal, Harris, Imperatori and McCullagh.

The fifth and last heading was entitled—"Cases of Atypical Mastoiditis confirmed by Operation." Doctors Haskins, Page, and Rae each reported a case.

After the Morning Session a luncheon was served at the Manhattan Eye, Ear and Throat Hospital, tendered by the New York members to the visiting Oto-Laryngologists.

The Afternoon Session was entirely taken up by operations at the various hospitals.

Those operating at the New York Eye and Ear Infirmary were: Doctors Dench, Lewis and John McCoy.

At the Post-Graduate Hospital:—Doctors, Forbes, Harris, Loughran, MacFarland, McPherson, O'Connell and Clarence Smith.

Those operating at the Manhattan Eye, Ear and Throat Hospital were:—Doctors Bereus, McCullagh, Dunning, Yankauer, Lynah, MacKenty, Phillips and Fowler.

Doctors Whiting and Friesner demonstrated on the cadaver a new operation on the jugular bulb. Doctor Freudenthal also presented for examination a number of cases of laryngeal tuberculosis.

HARMON SMITH, Chairman.

Report of the Mid-Western Section:

The meeting of the Mid-Western section was held at the Hotel Broadmoor, Colorado Springs, February 26, 1921. The entire day was devoted to the meeting, with a luncheon at noon for members and invited guests. Of the total membership of eleven in this section, nine were in attendance at the meeting and seven read papers, the remaining two taking part in the discussions. There were thirty-three, including members and guests, who registered at the meeting. Considering that all members of this section live in the State of Colorado, it is worthy of note that one guest came from Utah, one from Wyoming and one from Nebraska, to attend the meeting. Following the close of the meeting in the evening, dinner was served at the Country Club, after which, further informal discussion of the papers read during the day, was freely carried on. In this meeting every effort was made to arouse the interest of the younger men with the idea of prospective membership. The following is the program in detail:

1. The Contraindication to the Use of Quinine and the Salicylates in the Treatment of Diseases of the Middle Ear. Dr. C. E. Harner, Denver, Colorado (by invitation).

2. Recurrent Acute Infratonsillar Lymphadenitis Subsequent to Enucleation of the Faucial Tonsil. Dr. Harry L. Whitaker, Denver, Colorado (by invitation).

3. The Nasal Status in Retrobulbar Optic Neuritis. Dr. Thomas J. Gallagher, Denver, Colorado.

4. Ocular Diseases of Nasal Origin. Dr. James A. Patterson, Colorado Springs.

5. Acute Otitis Media in Children. Dr. D. A. Vanderhoof, Colorado Springs.

6. The Value of the Tuning Forks in Aural Examination. Dr. William C. Bane, Denver, Colorado.

7. Post-operative Treatment of Simple Mastoidectomy. Dr. John B. Potts, Omaha, Nebraska.

8. Cerebellar Abscess of Otitic Origin. Dr. Frank L. Dennis, Colorado Springs.

9. Roentgenology of the Mastoids with Conclusions Based on One-hundred Cases. Dr. Frank Spencer, Boulder, Colorado.

10. Surgery of the Mouth and Palate. Dr. T. E. Carmody, Denver, Colorado.

W. V. Mullin, Chairman.

Report of the Western Section:

Eleven members and twelve guests were present.

The program was as follows:

Jan. 28th—Friday morning. Clinical meeting at Children's Hospital, 9 A. M. Dr. John Mackenzie Brown.

Friday afternoon, 2 P. M. Demonstration of Internal Ear Cases. Dr. Isaac Jones, Dr. Eugene Lewis.

7 P. M. Dinner, Wiltshire Country Club.

Jan. 29th—Saturday, 9 A. M. Los Angeles Athletic Club.

1. Brain Abscesses. A Report of Two Cases with Discussion. Dr. H. B. Graham, San Francisco.

2. A Double Sigmoid Sinus—Specimen Exhibited. Dr. John Mackenzie Brown, Los Angeles.

3. Unilateral Microtia, with Roentgenographic Illustration. Dr. Henry L. Wagner, San Francisco.

4. Thyro-glossal Cyst—Exhibit of Patient with Large Pouch (Food Collection) at Base of Tongue. Dr. Ernest W. Fleming, Los Angeles.

5. The Accessory Sinuses as an Etiological Factor in Bronchiectasis with Lantern Slide Demonstration. Dr. W. V. Mullin, Colorado Springs.

6. A Report on General Condition and Outlook for Doing Work in Oto-laryngology in Europe. A Recent Visit. Dr. Kaspar Pischel, San Francisco.

7. Laryngostomy, with Report of a Case. Dr. Edward Cecil Sewall, San Francisco.

At the clinical meeting at the Children's Hospital there were four tonsil operations and one mastoid operation with discussion.

At the County Hospital the following cases were demonstrated by Detling:

1. Sarcoma of the Tonsils—Treated by Radium with Apparent Cure.

2. Sarcoma of the Ethmoids.

3. Endothelioma of Nose with Cervical Gland Envolvement.

4. Gumma of the Larynx.

5. Papilloma of the Larynx.

6. Stricture of the Oesophagus.

7. Mastoid with Jugular Resection (Patient shown after operation).

8. Papilloma of the Larynx, operated and a section taken; by Suspension Laryngoscopy.

Lantern slide demonstration was made by Dr. Rae Taylor of two infants respectively one day and seven days old, showing the X-ray pictures of the chest, demonstrating enlarged thymus. Each new born babe had suffered with acute thymic symptoms—difficult breathing, cyanosis and fever. Both cases were treated by therapeutic X-ray doses, each with report of improvement of all symptoms and rapid decrease in size of thymus shadow.

Hill Hastings, Chairman.

Report of the Southern Section:

The Southern Section of this Society was held at the Battery Park Hotel in Asheville, N. C. on January 29, of the present year and the following program presented:

1. "Orbital Abscess Produced by Ethmoid Disease, with Report of a Case." Dr. Clifton M. Miller, Richmond, Va.

2. "Monocular Retrobulbar Optic Neuritis Caused by Purulent Maxillary Sinusitis." Dr. J. W. Jervey, Greenville, S. C.

3. "Cases where Clinical Evidence and Laboratory Findings Differ." Dr. J. A. Stucky, Lexington, Ky.

4. "Presentation of New Instruments."

5. "The Tuberculous Larynx as seen by the Lung Specialist." Dr. Charles L. Minor, Asheville, N. C. (By Invitation).

6. "The Treatment of Laryngeal Tuberculosis." Dr. Thomas E. Carmody, Denver, Col.

7. "An Invisible Scar Method in Cosmetic Surgery." Dr. Ira Frank, Chicago, Ill.

Discussion opened by Dr. H. H. Briggs, Asheville, N. C.

Joseph B. Greene, Chairman.

Committee on Necrology:

The committee on Necrology presented its report.

Dr. Loeb read the obituary of Dr. Linhart and Dr. Cott. The notice of other deaths came too late to have a report prepared. It was moved and seconded that the report be acknowledged by a standing vote and placed on record.

Report of Nominating Committee:

The following Fellows were recommended for election as the Board of Directors for the ensuing year:

Lewis A. Coffin, John F. Fairbairn, Greenfield Sluder, Thomas C. Worthington, John M. Foster, Grant Selfridge, William H. Haskin, Ewing W. Day, Herbert S. Birkett, La Fayette Page, Robert C. Lynch, Harris P. Mosher, James F. McCaw, Dunbar Roy, Lee Wallace Dean, James F. McKernon, Norval H. Pierce, George L. Richards.

N. H. Pierce,
R. McKinney,
F. P. Emerson,
E. B. Dench,
T. J. Harris, Chairman.

Presentation of Patients:

Dr. Chevalier Jackson, Philadelphia, presented a patient, a young man who had been shot in the back, the wound of entrance being under the scapula and the missile penetrating the lung. The bronchoscope was introduced and the bullet was taken out through the mouth.

New Instruments:

Dr. James B. Greene presented an instrument for dissecting the tonsils, which was useful in quinsey and in congested tonsils of children, the line of separation between the mucous membrane and the tonsil being shown, and pressure being applied to the soft palate over the tonsils.

Dr. William Wesley Carter presented a device for use of gold wire splints after submucous operation, leaving flaps of mucous membrane in perfect coaptation, so that the patient could breathe through the nose. A rubber splint was used with half a dozen cords of gold wire around it, well lubricated, and slipped into the nostril, after which the splint was withdrawn. This prevented hematoma and stopped hemorrhage, enabling patients to breathe in the natural manner, which completely changed the aspect of the case.

Dr. Sidney Yankauer presented an instrument for applications of radium, in the form of a tube introduced into the larynx, through which the patient could breathe. The tube contained a metallic capsule in which the radium emanations were placed, thus coming into contact with the tumor. The rest of the space being plugged with tin foil. The patient should receive a dose of cocain and morphin. A probe was then introduced into the larynx and placed against the tumor. A finger placed against the probe against

the upper teeth gave the distance of the growth from the upper teeth. The end of the instrument projected beyond the teeth. The distance of the end of the instrument from the growth could be measured. The patient closed the mouth against the lower end of the tube. The instrument was supported by adhesive. It was possible to leave such an instrument in place four hours, when the patient would become more or less dyspnoeic. A side tube could then be added, connected with an oxygen tank; this relieved the dyspnea and kept the patient comfortable. Application of radium in this manner gave rays only from one side of the emanation tube, but it was a safe method before removing the growth surgically in order to cause demarcation between the growth and the healthy tissue, so that when removing the tumor by suspension laryngoscopy the growth could almost be shelled out. In one case in which this method was used, there had been no recurrence after seven months.

Dr. H. L. Lynah presented an esophageal speculum in which the end of the instrument did not flare back in the eye. The bougies were made so that the tips did not come off, and this was an advantage in examination of diverticula of the esophagus.

Dr. Lynah also presented spirals used in lung abscess, the spiral being placed in the branch of the bronchus and turned either to inject the upper or the lower branch as required. Formerly there had been leakage of the bismuth at the joint, but now flexible collodion was used which made the instrument water tight and avoided leakage.

Dr. H. H. Briggs, showed a transilluminator for sinus work in which the light passed through the superior antral wall and came out into the roof of the mouth. The shank was curved, instead of the usual straight shank. The tip was pressed against the lower lid, against the inferior orbital commissure, the light passing down into the roof of the mouth and floor of the antrum, as represented by the outer portion of the roof of the mouth, outside the molars. The advantage of this method over the usual one (in which the light passed through the roof of the mouth making illumination difficult) was that the light passed through the superior and inferior walls and was more likely to detect any pathological condition in the antrum.

Secretary's Report:

To the Fellows of the American Laryngological, Rhinological and Otological Society, Incorporated:

Gentlemen:

It is with great pleasure that your Secretary can report the splendid progress that has been attained this year by the Society both in growth of new Fellows and in the high quality of the scientific work that has been done at the Section meetings, which have been attended by 137 Fellows, and the program that has been offered for this meeting which is largely due to the untiring efforts of your President, who in addition has attended three of the Sections.

During the year we have lost three old and loyal Fellows by death, Dr. G. F. Cott, Dr. C. P. Linhart and Dr. J. J. Kyle, and one of our Honorary Fellows, Sir Felix Semon.

Drs. F. C. Cobb, A. B. Thrasher, H. Bert Ellis, J. A. Thompson and G. Morgenthau have resigned.

One fellow has been dropped for non-payment of dues and the following have been elected Emeritus Fellows: A. B. Thrasher, Fred Cobb, Frank Hyatt, Price Brown, H. Bert Ellis, J. Solis Cohen, J. A. Thompson.

This loss has been more than offset by the election of 15 new Fellows and 30 applications have been approved during the year so that we will probably have a still greater increase at our next meeting.

It is most gratifying to report that the delinquent list for attendance has been practically eliminated up to the present meeting all but five having attended meetings of the Sections and those five having offered excuses.

Respectfully submitted,

W. H. Haskin, Sec'y.

It was moved and seconded that the Secretary's report be approved and placed on file.

Report of the Treasurer.

AMERICAN LARYNGOLOGICAL, RHINOLOGICAL AND OTOLOGICAL SOCIETY.

STATEMENT OF RECEIPTS AND DISBURSEMENTS.
MAY 22, 1920 to MAY 23, 1921.

Cash on hand May 22, 1920		$ 491.16
Receipts.		
Transferred from Savings Account	$ 600.00	
Loan on Cresson Borough School Bonds	1,500.00	
Dues	2,763.80	
Initiations	110.00	
		$4,973.80
Total		$5,464.96
Disbursements. (Per Detailed Statement Attached).		
Expenses Boston meeting	$ 173.42	
Expenses Sectional meetings	75.00	
Expenses Secretary, 1919-1920	200.00	
Expenses Treasurer 1920-1921	134.42	
Editing and publishing transactions, postage, etc.	3,042.46	
Investments	1,602.16	
Interest on Loan	17.75	
		$5,245.21
Cash on hand May 23, 1921		$219.75

Statement of Investment Accounts.

Cash deposited with People's National Bank, Pittsburg, Pa., in Savings Account, pass book No. F 127, as follows: F 127, as follows:	
Cash on hand May 22, 1920	$ 506.79
Receipts from Investments.	
Dividend Penna. R. R. Stock	$ 300.00
Westinghouse Air Brake Stock	259.00
Cresson Borough School Bonds	180.00
Liberty Bond Coupons	143.74
United Kingdom, Great Britain and Ireland bond	55.00
Government of Norway Bond	40.00
Interest on Savings Account	24.29
	$1,002.03
Total	$1,508.82
Disbursements.	
Transferred to Checking Account	$ 600.00
Cash on hand May 23, 1921	$ 908.82

Investments.

	Par Value
100 shares Penna. R. R. Stock	$ 5,000.00
40 shares Westinghouse Air Brake Stock	2,000.00
8 Cresson Borough School Bonds	4,000.00

2 First Liberty Loan Bonds	2,000.00
1 Fourth Liberty Loan Bond	1,000.00
2 Victory Bonds ($500 each)	1,000.00
1 United Kingdom, Great Britain and Ireland Bond	1,000.00
1 Government of Norway Bond	1,000.00
	$17,000.00

AMERICAN LARYNGOLOGICAL, RHINOLOGICAL AND OTOLOGICAL SOCIETY.

STATEMENT OF RECEIPTS AND DISBURSEMENTS.

MAY 22, 1920 TO MAY 23, 1921.

Balance May 22, 1920		$ 491.16
Receipts.		
Transferred from Savings Account	$ 600.00	
Loan on Cresson School Bonds	1,500.00	
1 Dues received year 1916-1917	10.00	
1 Dues received year 1918-1919	10.00	
11 Dues received year 1919-1920	110.00	
263 Dues received year 1920-1921	2,633.80	
11 Initiations, year 1920-1921	110.00	
		$4,973.80
		$5,464.96

Disbursements.

Vol. No.		
1	Mrs. V. B. Alverez. Part payment reporting Boston meeting	$ 100.00
2	D. F. Kent. Lantern three days (Boston)	45.00
3	Dr. Bert Ellis. Reporting meeting Western Section	25.00
4	Dr. Arthur Weil. Reporting Southern Section	25.00
5	Dr. Wm. H. Haskin, Expense Secretary 1919-1920.	200.00
6	V. L. P. Shriver. Renewal premium Treasurer's bonds	37.50
7	Cash, postage stamps Treasurer's office	9.00
8	Mrs. V. B. Alverez. Expenses stenographer at meeting	28.42
9	People's Nat. Bank. Discount Canadian Checks	2.90
10	Commonwealth Trust Co. Renewal safe deposit box	5.00
11	Commonwealth Trust Co. Government of Norway Bond	1,011.66
12	Commonwealth Trust Co. Six shares Westinghouse Air Brake stock	590.50
13	Mercury Publishing Co. Transactions, postage, printing, expressage, etc.	2,959.80
14	Dr. George L. Richards. Editorial expenses	82.66
15	Dr. E. W. Day. Treasurer's expenses	75.00
16	People's Nat. Bank. Discount Canadian checks	1.52
17	The Professional Press. Red book of Eye, Ear, Nose and Throat	3.50

18	People's Nat. Bank. Interest on Loan..	17.75	
19	Dr. Harmon Smith. Expenses meeting Eastern section	25.00	
			$5,245.21
	Cash on hand May 23, 1921.....		$ 219.75

Audited and certified correct,

L. V. SATTELE,
Accountant with National Tube Co.

AMERICAN LARYNGOLOGICAL, RHINOLOGICAL AND OTOLOGICAL SOCIETY.

STATEMENT OF INVESTMENT ACCOUNTS.

AT THE CLOSE OF BUSINESS MAY 23, 1921.

Cash deposited with People's National Bank Pittsburgh, Pa., in Savings Account, pass book No. F 127, as follows:

May 22, 1920 Balance ..... $ 506.79

Receipts.

June 8, 1920	Dividend P. R. R. stock.....$	75.00	
June 1, 1920	Interest	7.32	
June 15, 1920	Cresson Borough School Bond Coupons	90.00	
June 15, 1920	Liberty Bond Coupons	101.23	
July 31, 1920	Westinghouse Air Brake Stock	59.50	
Sept. 2, 1920	Dividend P. R. R. stock.....	75.00	
Oct. 30, 1920	Westinghouse Air Brake Stock	59.50	
Nov. 24, 1920	Liberty Bond Coupons.....	42.51	
Nov. 29, 1920	Cresson Borough School Bond Coupons	90.00	
Dec. 2, 1920	Dividend P. R. R. stock	75.00	
Dec. 1, 1920	Interest	16.97	
Feb. 1, 1921	Westinghouse Air Brake Stock	70.00	
Mar. 2, 1921	Dividend P. R. R. stock	75.00	
Mar. 4, 1921	United Kingdom, Great Britain and Ireland Bond	55.00	
April 30, 1921	Westinghouse Air Brake stock	70.00	
May 2, 1921	Government of Norway bond.	40.00	
			$1,002.03
	Total		$1,508.82

Disbursements.

Transferred to Checking Account.....$	600.00
Balance on hand May 23, 1921.....$	908.82

Investments.

	Par Value
100 shares Penna. R. R. stock.....$	5,000.00
40 shares Westinghouse Air Brake Stock.....	2,000.00
8 Cresson Borough School Bonds, 4½%.....	4,000.00
2 First Liberty Loan Bonds.....	2,000.00
1 Fourth Liberty Loan Bond.....	1,000.00

2 Victory Bonds	1,000.00
1 United Kingdom Great Britain and Ireland Bond, 5½%	1,000.00
1 Government of Norway Bond, 8%	1,000.00
	$17,000.00

Audited and found correct,

L. V. SATTELE,

Accountant with National Tube Co.

Report of the Auditing Committee:

The report of the Auditing Committee, consisting of Drs. Carmody, Keiper and Wishart was presented. Dr. Carmody stated that the books had been examined and found correct. It was mentioned that Dr. Day sent bills out after the meeting. It would be better the first of the year. This suggestion was offered as a motion, seconded and carried and the report ordered to be placed on record.

Report of the Committee on the Teaching of Oto-Laryngology:

CURRICULUM RECOMMENDED AS THE MINIMUM WHICH SHOULD BE FOLLOWED BY THOSE WHO SHALL HEREAFTER SEEK TO BECOME RECOGNIZED AS SPECIALISTS IN OTO-LARYNGOLOGY.

Believing that the lack of proper special education on the part of those who claim to be specialists in Oto-Laryngology has been disclosed by the experiences of the office of the surgeon general in attempting to secure for the American Army a service in Oto-Laryngology which should be the equal of that of the other subdepartments of medicine, this committee representing the American Medical Association, and all the Societies upon this continent, in connection with the specialty, recommend the adoption of the following as a satisfactory minimum for the guidance of those who desire to take up the specialty.

1. We recommend that students preparing for the practice of Otolaryngology be graduates of Class A medical schools and have completed a year's service as interne in an approved general hospital or its equivalent.

2. We recommend that when possible the preparation for special practice be started immediately after completion of this hospital year. We do not approve of specialization beginning during the undergraduate medical course nor in the interne year.

3. We recommend that the minimum training consist of eighteen months full time work, the first year to be spent in one place. The last six months may be continued here or the work may be pursued in other approved centers. During the first year one half of the

time should be devoted to the clinical study of cases, the other half to the study of the fundamental sciences and to library work.

4. All of this work must be on the basis of genuine graduate instruction in which the student does his work individually under proper supervision.

5. The work in the fundamental sciences should be done in properly equipped laboratories such as exist in all Class A medical schools. The clinical work must be done in a properly equipped and properly organized outpatient department of either a Class A medical school or a special hospital, the student serving as clinical assistant.

6. On the completion of the first year's fundamental training the student is advised to secure so far as this is possible the position of interne in a special hospital or of resident in oto-laryngology in a general hospital.

7. For those students who are not able to secure suitable hospital positions after the completion of the first year's fundamental training, the remaining six months' work necessary to fill out the eighteen months' minimum requirement may be taken as continuation of the first year's work in the same institution or by taking special work in other centers. Others may devote the last six months serving as assistant in the practice of some established specialist. When the latter alternatives are followed the work selected must meet the approval of the institution in which the first year's work has been taken.

8. We recommend that on the completion of the above requirements the student be granted a suitable certificate setting forth that he has had the proper preparation for taking up the practice of the specialty. This certificate is to be granted by the institution in which the first year's work has been taken. We make no recommendation regarding the granting of higher degrees. We feel satisfied that such degrees will be granted as readily by the university to those students preparing for the practice of Oto-laryngology as to students in any other field, whenever the work pursued meets the requirements established for the granting of such degrees.

9. We recommend that the student in Oto-laryngology, devote three years if possible, to the study of his specialty.

The committee hope to be able to assist the candidate in the following ways:

1. Securing from the graduate departments of the universities a suitable degree, to be conferred only upon such candidates as have followed the above course.

2. By correspondence with the graduate departments of the

universities, with a view to securing a uniformity in the course of study to be pursued.

3. By arranging with the hospitals referred to above to limit their appointments, as internes, to those candidates who have taken the above course.

4. By preparing a list of hospitals to which candidates may safely be recommended to apply for the position of interne.

5. By securing reliable information as to the facilities offered by various centres, which they may place at the disposal of those who desire to perfect themselves still further in any department in Oto-Laryngology, after the above course has been concluded.

A copy of these recommendations to be transmitted to the council of the American Medical Association.

It is recommended that the committee of the several special societies be continued in order to better advance the subject of graduate instructions in Oto-Laryngology.

D. J. Gibb Wishart,
47 Grosvenor Street, Toronto.
Chairman of the Committee.

Thomas J. Harris,
104 East 40th St., New York City.
Secretary of the Committee.

MEMBERS.

Lee W. Dean, Robert Levy, Burt R. Shurly,	For the American Medical Association.
Cornelius G. Coakley, George L. Richards, Harris P. Mosher,	For the American Laryngological Association.
B. Alex. Randall, Thomas J. Harris, H. S. Birkett,	For the American Otological Association.
D. J. Gibb Wishart, Charles W. Richardson, S. MacCuen Smith,	For the American Laryngological, Rhinological and Otological Society.
J. M. Ingersoll, Joseph C. Beck, T. E. Carmody,	For the American Academy of Ophthalmology and Oto-laryngology.

Report of Committee on Deaf Child:

The second meeting of the permanent committee on the Deaf Child of the American Medical Association was held at the Drake Hotel in Chicago, February 4, 1921 at five o'clock. The members of this committee present were: Dr. Charles W. Richardson of Washington, Chairman: Dr. Elmer L. Kenyon of Chicago, and Dr. Max A. Goldstein of St. Louis, secretary. Dr. Charles W. Richardson and Dr. Max A. Goldstein also represented the American Otological Society and the American Triological Society in similar committee.

As announced by the Chairman, the principal work before the committee at this meeting was to codify and tabulate the laws in the several states of the union relating to the education of the deaf, to urge the recommendation to all health authorities, medical officers, etc., in states where no laws have as yet been enacted to prompt action in this work and to suggest improvements in states where such laws are effective but where they do not as yet meet all of the requirements of the present status and education of the deaf.

The secretary was instructed to arrange abstracts of laws in the different states so that they may be readily consulted for reference and to add this digest of state laws concerning the education of the deaf to the minutes and report of this committee to be presented to the annual meeting of the American Medical Association in Boston in June 1921.

On motion duly made and seconded, Dr. Kenyon was authorized to secure all data of laws in the several states concerning Corrective Speech and its supervision and the results and statistics of surveys made in the larger cities of the character, extent and proportion of various types of defective speech among school children.

The committee further considered the preparation of a syllabus of lectures for medical schools which shall have for their purpose the instruction of the undergraduate in problems of the deaf and defective in speech. It was agreed that such a syllabus would be presented for consideration of the committee at its next meeting and that all medical schools be urged to disseminate such information through their departments of oto-laryngology.

Dr. Max A. Goldstein reported that he had acted as representative of this committee at the Joint Convention of Superintendents, Principals and Instructors of the Deaf at Mount Airy, Pa., June 28, 1920 and that the following resolution for consideration of the American Association for Promoting the Teaching of Speech to

the Deaf and the Society of Progressive Oral Advocates was presented:

Resolved, That we recommend exclusively oral instruction of deaf children and that the oral teaching of the congenitally deaf child and the acquired deaf child be made a part of a department of the public school system in all larger cities.

The American Association Promoting the Teaching of Speech to the Deaf had entered into some discussion of this resolution and had accepted the report of our Committee on the Deaf Child in the following resolution presented by the Superintendent of the Virginia State School for the Deaf and seconded by Mr. J. W. Jones, superintendent of the Ohio State School for the Deaf.

This motion was carried.

The Society of Progressive Oral Advocates endorsed the resolution of the Committee on the Deaf Child in the following motion, presented by Mr. Frank W. Booth, Superintendent of the Nebraska State School for the Deaf and seconded by Miss Julia M. Connery, Principal, Central Institute for the Deaf:

Moved, That the Society of Progressive Oral Advocates accept the report of the Committee of the American Medical Association and that it endorses its recommendations and will co-operate as far as possible in carrying out the recommendations made.

This motion was carried by a preponderant vote.

The secretary reported further that the matter of Survey and Standardization of Schools for the Deaf had been carefully considered at the Mt. Airy Convention and that a committee representing the several associations at this congress had been named to develop this question. He reported further that steps were under way to enlist the cooperation of one of the large educational foundations to make such a survey practically possible.

Dr. D. J. Gibb Wishart then presented the report of the Committee on the Training of Specialists. This Committee had been appointed in 1911 to look into the undergraduate and the post graduate course of teaching. The recommendations regarding undergraduate training had been adopted in all medical schools. The Committee had acted jointly with several societies, of which Dr. Wendell C. Phillips was chairman, representing the A. M. A. and a joint report was then prepared to go before the A. M. A.

Dr. Edward B. Dench moved the report be adopted and placed on record, and that the Committee be continued. The was seconded and carried.

A meeting of the newly elected Board of Directors was held at the Hotel Chelsea, Atlantic City, N. J., on June 4th, 1921.

Dr. R. C. Lynch was elected temporary Chairman, and Dr. W. H. Haskin, Secretary.

Present: Drs. R. C. Lynch, H. P. Mosher, L. A. Coffin, Dunbar Roy, Lafayette Page, H. S. Birkett, J. F. McCaw and W. H. Haskin.

On motion duly seconded and carried the Secretary was instructed to cast one ballot for all officers as recommended by the Nominating Committee as follows.

The recommendations for officers made by the Nominating Committee was read by the Secretary as follows:

President—Lewis A. Coffin.

Vice Presidents—J. F. Fairbairn, Buffalo, N. Y., Eastern Section; T. C. Worthington, Baltimore, Md., Southern Section; Greenfield Sluder, St. Louis, Mo., Middle Section; J. M. Foster, Denver, Colorado, Mid-Western Section; Grant Selfridge, San Francisco, California, Western Section.

Secretary—William H. Haskin, New York City.

Treasurer—E. W. Day, Pittsburg, Pa.

Chairman of Publication—George L. Richards, Fall River, Mass.

Council, Class A—H. S. Birkett, Montreal, Canada; Lafayette Page, Indianapolis, Ind., R. C. Lynch, New Orleans, La.

Council, Class B—H. P. Mosher, Boston, Mass., F. J. McCaw, Watertown, N. Y., Dunbar Roy, Atlanta, Ga.

Council, Class C—L. W. Dean, Iowa City, Iowa; J. F. McKernon, New York City, N. H. Pierce, Chicago, Ill.

The Secretary announced that the ballot had been cast and the officers were declared duly elected.

The meeting then adjourned until January 7th, 1922.

Respectfully submitted,

W. H. Haskin, Sec'y.

FELLOWS

1901 Dr. Jos. H. Abraham.....130 West 58th St., New York
1913 Dr. William J. Abbott..1836 Euclid Ave., Cleveland, Ohio
1915 Dr. Lawrence Dade Alexander, 130 West 59th St., New York
1908 Dr. John H. Allen.....711 Congress St., Portland, Me.
1905 Dr. Frank Allport, Chicago Savings Bank Bldg., State and Madison St., Chicago, Ill.
1904 Dr. F. C. Ard.....604 Park Ave., Plainfield, N. J.
1903 Dr. Hubert Arrowsmith...170 Clinton St., Brooklyn, N. Y.
1899 Dr. William J. Atkinson.....27 Church St., Paterson, N. J.
1905 Dr. Jas. A. Babbitt, 1901 Chestnut St., Philadelphia, Pa.
1905 Dr. William C. Bane, Metropolitan Bldg., Denver, Colo.
1915 Dr. William P. Barndollar, Westinghouse Building, Pittsburgh, Pa.
1904 Dr. John F. Barnhill, Pennway Bldg., Indianapolis, Ind.
1911 Dr. Harry A. Barnes, 520 Commonwealth Ave., Boston, Mass.
1903 Dr. Joseph C. Beck.....108 N. State St., Chicago, Ill.
1895 Dr. T. Passmore Berens, 25 Park Ave., New York City
1918 Dr. F. Nolton Bigelow, 124 Waterman St., Providence, R. I.
1905 Dr. H. S. Birkett.....252 Mountain St., Montreal, Can.
1912 Dr. Hugh B. Blackwell....148 West 58th St., New York
1906 Dr. Charles R. C. Borden, 520 Commonwealth Ave., Boston, Mass.
1918 Dr. Wesley C. Bowers, 27 West 49th St., New York City
1898 Dr. W. C. Braislin.....425 Clinton Ave., Brooklyn, N. Y.
1915 Dr. Alfred Braun.....31 East 72nd St., New York
1914 Dr. H. H. Briggs.....73 Haywood St., Asheville, N. C.
1915 Dr. Clayton M. Brown, 510 Delaware Ave., Buffalo, N. Y.
1911 Dr. H. Beattie Brown, 39 Baker St., Saranac Lake, N. Y.
1909 Dr. John E. Brown, 370 E. Town St., Columbus, Ohio
1916 Dr. John Mackenzie Brown, 1002 Brockman Building, Los Angeles, Cal.
1917 Dr. Seth A. Brumm, 1411 Walnut St., Philadelphia, Pa.
1903 Dr. W. Sohier Bryant.....107 East 39th St., New York

1915 Dr. Louis J. Burns, 1906 Chestnut St., Philadelphia, Pa.
1914 Dr. Ralph Butler....1926 Chestnut St., Philadelphia, Pa.
1915 Dr. Don M. Campbell, 801 Peter Smith Bldg., Detroit, Mich.
1903 Dr. Wm. E. Campbell, Atlanta National Bank Bldg., Atlanta, Ga.
1904 Dr. R. Bishop Canfield, 330 S. State St., Ann Arbor, Mich.
1912 Dr. Thomas E. Carmody, Metropolitan Bldg., Denver, Colo.
1915 Dr. Wm. Wesley Carter.....2 West 67th St., New York
1908 Dr. William B. Chamberlin, 614 Osborn Bldg., Cleveland, Ohio
1900 Dr. Talbot R. Chambers, 15 Exchange Pl., Jersey City, N. J.
1900 Dr. William E. Chenery, 377 Commonwealth Ave., Boston, Mass.
1907 Dr. George M. Coates..1811 Spruce St., Philadelphia, Pa.
1895 Dr. Lewis A. Coffin.....114 East 54th St., New York
1895 Dr. Henry Coggeshall.....40 East 58th St., New York
1914 Dr. Lee Cohen.....1820 Eutaw Place, Baltimore, Md.
1899 Dr. Burnitt Collins, 645 St. Marks Ave., Brooklyn, N. Y.
1920 Dr. B. N. Colver, 182 Manchester St., Battle Creek, Mich.
1914 Dr. Ray Connor, 503 Washington Arcade, Detroit, Mich.
1900 Dr. Theodore Corwin, 20 Central Ave., Newark, N. J.
1901 Dr. Algernon Coolidge....613 Beacon St., Boston, Mass.
1916 Dr. Claude E. Cooper, Metropolitan Bldg., Denver, Colo.
1896 Dr. Charles N. Cox...257 Jefferson Ave., Brooklyn, N. Y.
1912 Dr. Gerhard H. Cox.....137 East 54th St., New York
1906 Dr. Robert H. Craig, 510 Sherbrooke St., W. Montreal, Can.
1897 Dr. Eugene A. Crockett, 298 Marlboro St., Boston, Mass.
1895 Dr. Wm. Ledlie Culbert.....16 East 54th St., New York
1904 Dr. John F. Culp.....410 No. Third St., Harrisburg, Pa.
1918 Dr. Henry Mortimer Cunningham, Birks Bldg., Vancouver, B. C.
1916 Dr. Franklin E. Cutler, 1025 Schofield Bldg., Cleveland, Ohio
1912 Dr. George E. Davis.....42 West 77th St., New York
1895 Dr. Ewing W. Day, Westinghouse Bldg., Pittsburgh, Pa.
1914 Dr. Lee Wallace Dean.....Iowa City, Iowa
1915 Dr. Frederick F. C. Demarest, 29 Academy St., Passaic, N. J.
1895 Dr. Edward B. Dench.....15 East 53rd St., New York

1918 Dr. Frank L. Dennis, 218 Burns Bldg., Colorado Springs, Colo.
1914 Dr. Jesse W. Downey, Jr., The Buckler, Charles and Center, Baltimore, Md.
1900 Dr. William H. Dudley, 512 Brockman Bldg., Los Angeles, Cal.
1898 Dr. Arthur B. Duel.....27 East 57th St., New York
1895 Dr. John Dunn....411 East Franklin St., Richmond, Va.
1920 Dr. Henry S. Dunning.....33 East 68th St., New York
1916 Dr. John W. Durkee...142 Clinton St., Brooklyn, N. Y.
1915 Dr. James Garfield Dwyer...40 East 41st St., New York
1900 Dr. Wells P. Eagleton..15 Lombardy St., Newark, N. J.
1916 Dr. Thomas O. Edgar, Dixon National Bank Bldg., Dixon, Ill.
1913 Dr. Joshua A. Ellegood, Equitable Bldg., Wilmington, Del.
1907 Dr. Francis P. Emerson, 520 Commonwealth Ave., Boston, Mass.
1907 Dr. Linn Emerson....Metropolitan Bldg., Orange, N. J.
1914 Dr. Curtis C. Eves....247 So. 17th St., Philadelphia, Pa.
1914 Dr. John F. Fairbairn.....131 Allen St., Buffalo, N. Y.
1900 Dr. Thomas H. Farrell.....236 Genessee St., Utica, N. Y.
1901 Dr. George Fetterolf 2047 Chestnut St., Philadelphia, Pa.
1918 Dr. Lewis Fisher.....1820 Spruce St., Philadelphia, Pa.
1912 Dr. Mark O. Fisher.....Parkersburg W. Va.
1915 Dr. Stanwood E. Fisher.....192 State St., Portland, Me.
1899 Dr. Ernest W. Fleming 523 West 6th St., Los Angeles, Cal.
1915 Dr. Henry Hall Forbes.....40 East 41st St, New York
1911 Dr. Edgar A. Forsyth....471 Virginia St., Buffalo, N. Y.
1907 Dr. John M. Foster.....Metropolitan Bldg., Denver Col.
1912 Dr. Edmond P. Fowler.....114 East 54th St., New York
1916 Dr. Ira Frank.....104 So. Michigan Ave, Chicago, Ill.
1901 Dr. Wolff Freudenthal.....24 West 88th St., New York
1921 Dr. Julius Dworetzky.....7 Law St., Liberty, N. Y.
1921 Dr. Calvin A. Faunce, Jr., 320 Commonwealth Ave., Boston, Mass.
1921 Dr. T. E. Fuller, Texarkana Nat. Bank Bldg., Texarkana, Ark.
1921 Dr. J. B. Gregg, Security Nat. Bank Bldg, Sioux Falls, So. Dak.
1921 Dr. J. C. Keeler....Medical Arts Bldg., Philadelphia, Pa.
1921 Dr. H. I. Lillie.....Mayo Foundation, Rochester, Minn.

1921 Dr. J. L. Maybaum.....1 West 70th St., New York
1921 Dr. L. A. Schipfer.....Bismarck, No. Dak.
1921 Dr. Grant Selfridge.....Schroth Bldg., San Francisco, Cal.
1921 Dr. G. O. Sharrett.....45 Bedford St., Cumberland, Md.
1921 Dr. Robert Sonnenschein, 4534 Michigan Ave., Chicago, Ill.
1921 Dr. G. L. Tobey, Jr.....416 Marlborough St., Boston, Mass.
1921 Dr. D. H. Walker,..390 Commonwealth Ave., Boston, Mass.
1921 Dr. N. S. Weinberger....Robert Packer Hospital, Sayre, Pa.
1921 Dr. J. Gordon Wilson..104 So. Michigan Ave., Chicago, Ill.
1915 Dr. Isidore Friesner.....814 Lexington Ave., New York
1900 Dr. Thomas J. Gallaher...California Bldg., Denver, Col.
1904 Dr. Perry G. Goldsmith, 84 Carlton St., Toronto, Can.
1899 Dr. Max A. Goldstein, 3858 Westminster Place, St. Louis, Mo.
1906 Dr. Charles Graef.....1125 Boston Road, New York
1915 Dr. Harrington Bidwell Graham, Shreve Bldg., San Francisco, Cal.
1896 Dr. Charles P. Grayson, 262 South 15th St., Philadelphia, Pa.
1904 Dr. D. C. Greene, Jr., 23 Bay State Road, Boston, Mass.
1919 Dr. Jas. S. Greene...44 Gramercy Park, New York City
1913 Dr. Joseph Berry Greene, Medicine Bldg., Asheville, N. C.
1916 Dr. Louis K. Guggenheim, 1006 Carleton Bldg., St. Louis, Mo.
1911 Dr. J. H. Guntzer.....40 East 41st St., New York
1895 Dr. Thomas H. Halsted, 405 Fayette Park, Syracuse, N. Y.
1900 Dr. Thomas J. Harris.....104 East 40th St., New York
1918 Dr. William G. Harrison, 904 Empire Bldg., Birmingham, Ala.
1900 Dr. Henry J. Hartz, 619 Whitney Bldg., Detroit, Mich.
1901 Dr. William H. Haskin.....40 East 41st St., New York
1906 Dr. Hill Hastings, Trust and Savings Bldgs., 6th and Spring Sts., Los Angeles, Cal.
1915 Dr. Harold Hays.....2178 Broadway, New York
1906 Dr. Halstead S. Hedges.....Charlottesville, Va.
1907 Dr. R. J. Held.....3531 Pacific Ave., Atlantic City, N. J.
1920 Dr. I. M. Heller.....355 East 149th St., New York City
1920 Dr. F. T. Hill.....111 Main St., Waterville, Me.
1900 Dr. F. E. Hopkins.....25 Harrison Ave., Springfield, Mass.
1913 Dr. John Horn.....72 East 92nd St., New York
1916 Dr. Hampton P. Howell.....114 East 54th St., New York

1917 Dr. E. V. Hubbard.....50 East 63rd St., New York
1901 Dr. Thomas Hubbard....515 Nicholas Bldg., Toledo, Ohio
1912 Dr. Lester Mead Hubby.....27 West 68th St., New York
1901 Dr. Lee M. Hurd.....39 East 50th St., New York
1909 Dr. Samuel Iglauer.....701 Race St., Cincinnati, Ohio
1916 Dr. Charles J. Imperatori.....17 East 38th St., New York
1920 Dr. H. J. Inglis.....43 Bay State Road, Boston, Mass.
1920 Dr. H. J. Inglis.....43 Bay State Road, Boston, Mass
1895 Dr. F. L. Jack.....215 Beacon St., Boston, Mass.
1901 Dr. Chevalier Jackson, 128 South 10th St., Philadelphia, Pa.
1899 Dr. Oliver H. Jackson, 34 North Main St., Fall River, Mass.
1909 Dr. J. W. Jervey.....Greenville, S. C.
1896 Dr. Otto Joachim....1630 Roberts St., New Orleans, La.
1896 Dr. Walter B. Johnson...170 Broadway, Paterson, N. J.
1906 Dr. Clarence Porter Jones, 3117 West Ave., Newport News, Va.
1919 Dr. Charles C. Jones.....14 West 7th St., Cincinnati, O.
1918 Dr. Isaac H. Jones....1920 Orange St., Los Angeles, Cal.
1900 Dr. George F. Keiper.....Lafayette, Ind.
1904 Dr. Beverley R. Kennon.....Taylor Bldg., Norfolk, Va.
1919 Dr. John D. Kernan.....156 East 79th St., New York
1905 Dr. Philip D. Kerrison.....58 West 56th St., New York
1906 Dr. J. S. Kirkendall.....Ithaca, N. Y.
1910 Dr. Frank E. Kittredge, Masonic Temple, Nashua, N. H.
1896 Dr. W. F. Knowles, 520 Commonwealth Ave., Boston, Mass.
1907 Dr. Samuel J. Kopetzky....51 West 73rd St., New York
1906 Dr. D. A. Kuyk.....114 North 5th St., Richmond, Va.
1908 Dr. Secord H. Large....536 Rose Bldg., Cleveland, Ohio
1908 Dr. J. J. Lasalle.....226 Michigan St., Toledo, Ohio
1915 Dr. Daniel W. Layman, 608 Hume-Mansur Bldg., Indianapolis, Ind.
1896 Dr. M. D. Lederman.....58 East 75th St., New York
1904 Dr. George A. Leland, 354 Commonwealth Ave., Boston, Mass.
1895 Dr. Robert Levy.....Metropolitan Bldg., Denver, Colo.
1913 Dr. Eugene R. Lewis, 1920 Orange St., Los Angeles, Cal.
1915 Dr. Fielding O. Lewis..261 So. 17th St., Philadelphia, Pa.
1895 Dr. Robert Lewis.....48 West 40th St., New York
1912 Dr. Lorenzo B. Lockard, Metropolitan Bldg., Denver, Colo.
1895 Dr. H. W. Loeb....537 North Grand Ave., St. Louis, Mo.
1895 Dr. James E. Logan, 1208 Wyandotte St., Kansas City, Mo.

1900 Dr. Robert Livingston Loughran, 145 West 58th St., New York
1910 Dr. John B. Lowman.....142 Park Place, Johnstown, Pa.
1919 Dr. H. W. Lyman.....700 Carleton Bldg., St. Louis, Mo.
1915 Dr. Henry Lowndes Lynah, 114 East 54th St., New York
1913 Dr. Robert Clyde Lynch, 634 Maison Blanche Bldg., New Orleans, La.
1918 Col. Theodore C. Lyster, U. S. A. Ret., 1920 Orange St., Los Angeles, Cal.
1911 Dr. John Edmund MacKenty..43 West 54th St., New York
1915 Dr. George W. Mackenzie, 1831 Chestnut St., Philadelphia, Pa.
1918 Dr. Otis H. Maclay.....29 East Madison St., Chicago, Ill.
1920 Dr. A. A. MacLachlan.....Empire Bldg., Pittsburgh, Pa.
1896 Dr. Percy E. D. Malcolm.....410 Park Ave., New York
1904 Dr. Emilio Martinez.....56 Neptune St., Havana, Cuba
1913 Dr. George Paull Marquis.30 N. Michigan Ave., Chicago, Ill.
1905 Dr. William Beverly Mason..1738 M St., Washington, D. C.
1912 Dr. Justus Matthews, 1021 Metropolitan Bank Bldg., Minneapolis, Minn.
1900 Dr. James F. McCaw.202 Sherman Bldg., Watertown, N. Y.
1901 Dr. Lefferts A. McClelland, 78 McDonough St., Brooklyn, N. Y.
1904 Dr. John J. McCoy.....157 West 73rd St., New York
1915 Dr. Jas. Homer McCready, 816 Empire Bldg., Pittsburgh, Pa.
1907 Dr. Samuel McCullagh.....17 E. 38th St., New York
1897 Dr. Jas. F. McKernon.....62 West 52nd St., New York
1902 Dr. O. A. M. McKimmie, 1330 Massachusetts Ave., N. W., Washington, D. C.
1915 Dr. Richmond McKinney, Bank of Commerce and Trust Bldg., Memphis, Tenn.
1907 Dr. D. McPherson.....114 East 54th St., New York
1897 Dr. John O. McReynolds.....Trust Bldg., Dallas, Tex.
1902 Dr. Chas. S. Means.....137 East State St., Columbus, Ohio.
1914 Dr. Frederick Menge.25 East Washington St., Chicago, Ill.
1911 Dr. William F. Mercer, 1101 West Franklin St., Richmond, Va.
1896 Dr. Leonidas L. Mial.....Morristown, N. J.
1911 Dr. Clifton M. Miller...Stuart Circle Hosp., Richmond, Va.
1914 Dr. H. Edward Miller, 310 Metropolitan Building, St. Louis, Mo.

1901 Dr. Robert Milligan..Westinghouse Bldg., Pittsburgh, Pa.
1905 Dr. Jas. J. Mooney.....390 Delaware Ave., Buffalo, N. Y.
1903 Dr. Thomas W. Moore, First National Bank Bldg., Huntington, W. Va.
1915 Dr. Robert L. Moorhead..185 Hancock St., Brooklyn, N. Y.
1903 Dr. Harris P. Mosher.....828 Beacon St., Boston, Mass.
1901 Dr. Robert E. Moss.....Hicks Bldg., San Antonio, Texas
1919 Dr. William V. Mullin.Burns Bldg., Colorado Springs, Colo
1895 Dr. Carl E. Munger.....81 No. Main, Waterbury, Conn.
1907 Dr. John W. Murphy, 2700 Union Central Life Bldg., Cincinnati, Ohio.
1900 Dr. Gilbert D. Murray.....516 Spruce St., Scranton, Pa.
1901 Dr. Harry L. Myers, Taylor Bldg., 151 Granby St., Norfolk, Va.
1895 Dr. Robert C. Myles.....11 E. 48th St., New York
1915 Dr. Walter H. Nardin.....Bleckley Bldg., Anderson, S. C.
1918 Dr. Gordon B. New...Mayo Foundation, Rochester, Minn.
1915 Dr. Theodore E. Oertel.....Lamar Bldg., Augusta, Ga.
1900 Dr. James P. O'Kelley.501 Macheca Bldg., New Orleans, La.
1900 Dr. Seymour Oppenheimer....45 East 60th St., New York
1920 Dr. L. Ostrom.....People's Bank Bldg., Rock Island, Ill.
1900 Dr. Francis R. Packard, 304 South 19th St., Philadelphia, Pa.
1908 Dr. John R. Page.....127 East 62nd St., New York
1900 Dr. Lafayette Page, 603 Hume Mansur Bldg., Indianapolis, Ind.
1902 Dr. J. Walter Park...32 North 2nd St., Harrisburg, Pa.
1903 Dr. Jas. A. Patterson, 214 Burns Building, Colo. Springs, Colo.
1920 Dr. W. W. Pearson.....Equitable Bldg., Des Moines, Ia.
1895 Dr. Wendell C. Phillips.....40 West 47th St., New York
1896 Dr. Norval H. Pierce, 22 East Washington St., Chicago, Ill.
1906 Dr. Kaspar Pischell.....Butler Bldg., San Francisco, Cal.
1899 Dr. John B. Rae.....247 West 70th St., New York
1920 Dr. Jas. E. Reeder.....Davidson Bldg., Sioux City, Ia.
1908 Dr. Andrew J. N. Reik, 1202 No. Charles St., Baltimore, Md.
1906 Dr. Henry O. Reik.....300 East 30th St., Baltimore, Md.
1895 Dr. W. Scott Renner.....341 Linwood Ave., Buffalo, N. Y.
1898 Dr. George L. Richards, 124 Franklin St., Fall River, Mass.
1904 Dr. John D. Richards.....8 East 54th St., New York
1895 Dr. Charles W. Richardson, 1317 Connecticut Ave., Washington, D. C.

1905 Dr. Walter Roberts.....1732 Spruce St., Philadelphia, Pa.
1901 Dr. W. Humes Roberts. 461 East Colo. St., Pasadena, Cal.
1907 Dr. John A. Robinson.....40 E. 41st St., New York City
1919 Dr. Charles M. Robertson.....30 N. Michigan Ave., Chicago, Ill.
1896 Dr. Arthur G. Root.....218 States St., Albany, N. Y.
1908 Dr. Sylvan Rosenheim...1710 Linden Ave., Baltimore, Md.
1896 Dr. George T. Ross.....456 Mackay St., Montreal, Can.
1895 Dr. Dunbar Roy...Grand Opera House Block, Atlanta, Ga.
1904 Dr. C. C. Sandels.....Westinghouse Bldg., Pittsburgh, Pa.
1907 Dr. Wm. E. Sauer.....Humboldt Bldg., St. Louis, Mo.
1912 Dr. Rufus B. Scarlet, 78 North Clinton Ave., Trenton, N. J.
1914 Dr. William A. Scruton, 30 Central Park South, New York City
1914 Dr. Eugene T. Senseney....308 Lister Bldg., St. Louis, Mo.
1917 Dr. Geo. E. Shambaugh...People's Gas Bldg., Chicago, Ill.
1904 Dr. J. Clarence Sharp.....62 West 46th St., New York
1898 Dr. Warren S. Shattuck..160 Clinton St., Brooklyn, N. Y.
1907 Dr. B. R. Shurly.....32 West Adams Ave., Detroit, Mich.
1915 Dr. John R. Simpson..Westinghouse Bldg., Pittsburgh, Pa.
1910 Dr. Ross Hall Skillern, 1928 Chestnut St., Philadelphia, Pa.
1911 Dr. Greenfield Sluder.....3542 Washington Ave., St. Louis, Mo.
1908 Dr. A. John Smith.....Yonkers, New York
1903 Dr. Harmon Smith.....44 West 49th St., New York
1915 Dr. Owen Smith.....692 Congress St., Portland, Me.
1895 Dr. S. MacCuen Smith...1429 Spruce St., Philadelphia, Pa.
1905 Dr. E. Terry Smith.....36 Pearl St., Hartford, Conn.
1902 Dr. Herbert E. Smyth.....376 John St., Bridgeport, Conn.
1913 Dr. Frank R. Spencer....Physicians' Block, Boulder, Colo.
1911 Dr. Frederick N. Sperry, 33 College St., New Haven, Conn.
1906 Dr. Charles N. Spratt....Physician's and Surgeon's Bldg., Minneapolis, Minn.
1904 Dr. George E. Steel.....256 W. 79th St., New York
1915 Dr. Edgar J. Stein.....225 N. Duke St., Lancaster, Pa.
1900 Dr. Otto Jacob Stein., 30 North Michigan Ave., Chicago, Ill
1915 Dr. Waldo Charles Stickle.....86 Pierrepont St., Brooklyn, N. Y.
1902 Dr. F. L. Stillman.....185 E. State St., Columbus, Ohio
1898 Dr. George C. Stout....1611 Walnut St., Philadelphia, Pa.
1895 Dr. J. A. Stucky....The McClelland Bldg., Lexington, Ky.

1915 Dr. John James Sullivan, Jr.....401 Traders Bank Bldg., Scranton, Pa.
1900 Dr. Clement F. Theisen.....172 Washington Ave., Albany, New York
1895 Dr. C. A. Thigpen.....First National Bank Bldg., Montgomery, Ala.
1895 Dr. F. M. Thigpen.....First National Bank Bldg., Montgomery, Ala.
1907 Dr. John J. Thompsen.....3 Park Ave., Mt. Vernon, N. Y.
1907 Dr. Wade Thrasher.....N. E. corner 7th and Race Sts., Cincinnati, O.
1905 Dr. D. H. Trowbridge.....Fresno, Cal.
1906 Dr. Derrick T. Vail.....24 East 8th St., Cincinnati, Ohio
1915 Dr. Don Allison Vanderhoof....Exchange National Bank Bldg., Colorado Springs, Colo.
1896 Dr. Eugene L. Vansant.....2046 Chestnut St., Philadelphia, Pa.
1905 Dr. Antonie P. Voislawsky....33 East 68th St., New York
1915 Dr. Irving Wilson Voorhees, 114 East 54th St., New York N. Y.
1896 Dr. Henry L. Wagner..518 Sutter St., San Francisco, Cal.
1907 Dr. Ernest DeW. Wales.....1236 N. Pennsylvania St., Indianapolis, Ind.
1900 Dr. James S. Waterman.....676 St. Marks Ave., Brooklyn, N. Y.
1914 Dr. Arthur I. Weil.....717 Maison Blanche Bldg. Annex, New Orleans, La.
1901 Dr. Walter A. Wells..The Rochambeau, Washington, D. C.
1920 Dr. Francis W. White...174 West 58th St., New York City
1918 Dr. Leon E. White, 390 Commonwealth Ave., Boston, Mass.
1895 Dr. Joseph A. White, 200 East Franklin St., Richmond, Va.
1910 Dr. Frederick Whiting.....19 West 47th St., New York
1908 Dr. Alfred Wiener.....550 Park Ave., New York City
1916 Dr. Harold Wilson....1501 David Whitney Bldg., Detroit, Mich.
1896 Dr. Norton L. Wilson....410 Westminster Ave., Elizabeth, N. J.
1900 Dr. D. J. Gibb Wishart....47 Grosvenor St., Toronto, Can.
1904 Dr. George B. Wood....1830 Spruce St., Philadelphia, Pa.
1898 Dr. John F. Woodward.....153 Granby St., Norfolk, Va.

1909 Dr. Thomas C. Worthington....1102 N. Charles St., Baltimore, Md.
1909 Dr. Sidney Yankauer.....616 Madison Ave., New York

EMERITUS FELLOWS.

1898 Dr. J. Price Brown.....106 South Drive, Toronto, Can.
1897 Dr. F. C. Cobb.....11 Marlboro St., Boston, Mass.
1901 Dr. J. Solis Cohen, 2113 Chestnut St., Philadelphia, Pa.
1899 Dr. H. Bert Ellis .....Bradbury Bldg., Los Angeles, Cal.
1895 Dr. Frank Hyatt....The Rochambeau, Washington, D. C.
1895 Dr. J. A. Thompson..... R. F. D. No. 4, Brookville, Ind.
1895 Dr. A. B. Thrasher .....7th and Race Sts., Cincinnati, O.

HONORARY MEMBERS

1907 Dr. C. E. Ballance.....106 Hartley St., London, W., Eng.
1910 Dr. Alex Graham Bell.....1331 Connecticut Ave., N. W., Washington, D. C.
1907 Dr. Gius Grandenigo...Via Gughemo Sanfelice, 33 Naples, Italy
1900 Dr. Dundas Grant, 18 Cavendish Square, London, W., Eng.
1903 Dr. Edward Law.....8 Wimpole St., Cavendish Square, London, Eng.
1919 Dr. Fernand Lemaitre.....6 Sq. Money, Paris, France
1909 Dr. James Kerr Love.....650 Shields Road, Pollokshields, Glasgow, Scotland
1896 Dr. H. Lue.....54 Rue de Varenne, Paris, France
1896 Dr. John MacIntyre.....179 Bath St., Glasgow, Scotland
1898 Dr. E. J. Moure.....25 Cours du Jardin Publie, Bordeaux, France
1919 Dr. Frank Rose.....68 Wimpole St., London, W., Eng.
1898 Dr. E. Schmieglow...18 Norregade, Copenhagen, Denmark
1898 Dr. J. Sendziak.....10 Crywariska Str., Warsaw, Poland.
1919 Sir St. Clair Thomson..64 Wimpole St., London, W., Eng.
1902 Dr. Logan Turner..27 Walker Street, Edinburgh, Scotland

VICE-PRESIDENTS OF THE SOCIETY.

	Eastern Section.	Southern Section.	Middle Section.	Western Section
1896	Joseph O'Dwyer, M. D.	(Only one Vice-President elected).		
1897	F. L. Jack, M. D.	Wm. Shepperell, M. D.	J. S. Mahon, M. D.	J. E. Logan, M. D.
1898	A. G. Root, M. D.	A. W. Calhoun, M. D.	J. A. Thompson, M. D.	J. E. Schadle, M. D.
1899	C. W. Richardson, M. D.	C. A. Thigpen, M. D.	Max Thorner, M. D.	H. L. Wagner, M. D.
1900	G. H. Makuen, M. D.	J. A. Stucky, M. D.	H. S. Straight, M. D.	Robert Levy, M. D.
1901	W. S. Renner, M. D.	J. A. White, M. D.	N. H. Pierce, M. D.	J. O. McReynolds, M. D.
1902	H. H. Curtis, M. D.	C. F. McGahan, M. D.	H. W. Loeb, M. D.	E. W. Fleming, M. D.
1903	F. C. Cobb, M. D.	Dunbar Roy, M. D.	L. C. Cline, M. D.	P. F. Gildea, M. D.
1904	G. L. Richards, M. D.	J. F. Woodward, M. D.	C. Jackson, M. D.	R. W. Payne, M. D.
1905	S. MacCuen Smith, M. D.	Wm. Cheatham, M. D.	Thomas Hubbard, M. D.	M. A. Goldstein, M. D.
1906	T. H. Halsted, M. D.	H. L. Meyers, M. D.	W. L. Ballenger, M. D.	H. B. Ellis, M. D.
1907	F. B. Sprague, M. D.	J. M. Ray, M. D.	J. M. Ingersoll, M. D.	W. C. Bane, M. D.
1908	E. A. Crockett, M. D.	H. O. Reik, M. D.	J. F. Barnhill, M. D.	W. H. Roberts, M. D.
1909	F. R. Packard, M. D.	John Dunn, M. D.	R. B. Canfield, M. D.	J. C. Beck, M. D.
1910	J. F. McCaw, M. D.	O. A. M. McKimmie, M. D.	H. J. Hartz, M. D.	A. R. Solenberger, M. D.
1911	H. P. Mosher, M. D.	J. A. Kent, M. D.	LaFayette Page, M. D.	Wm. H. Dudley, M. D.
1912	Theodore Corwin, M. D.	Otto Joachim, M. D.	John A. Thompson, M. D.	Thomas J. Gallaher, M. D.
1913	George C. Stout, M. D.	J. W. Jervey, M. D.	Wm. E. Sauer, M. D.	Hill Hastings, M. D.
1914	Lewis A. Coffin, M. D.	F. M. Thigpen, M. D.	B. R. Shurley, M. D.	Lorenzo B. Lockard, M. D.
1915	Stephen H. Lutz, M. D.	Halstead S. Hedges, M. D.	John W. Murphy, M. D.	Frank R. Spencer, M. D.
1916	John B. Rae, M. D.	Robert C. Lynch, M. D.	William B. Chamberlin, M. D.	Thomas E. Carmody, M. D.
1917	John F. Culp, M. D.	Richmond McKinney, M. D.	John E. Brown, M. D.	James A. Patterson, M. D.
1918	D. Crosby Greene, Jr., M.D.	Thomas W. Moore, M. D.	D. W. Layman, M. D.	H. B. Graham, M. D.
1919	Robert Lewis, M. D.	Clifton M. Miller, M. D.	Otto J. Stein, M. D.	John J. Kyle, M. D.
1920	Wells P. Eagleton, M. D.	Joseph B. Greene, M. D.	Samuel Iglauer, M. D.	H. Bert Ellis, M. D.
1921	Harmon Smith, M. D.	Joseph B. Greene, M. D.	Joseph C. Beck, M. D.	Hill Hastings, M. D.
1922	J. F. Fairbairn, M. D.	T. C. Worthington, M. D.	Greenfield Sluder, M. D.	Grant Selfridge, M. D.

	Mid-Western Section.
1918	Frank R. Spencer, M. D.
1919	Frank L. Dennis, M. D.
1920	Claude E. Cooper, M. D.
1921	William V. Mullin, M. D.
1922	J. M. Foster, M. D.

SECRETARY AND TREASURER.

1896 to 1900
Robert Cunningham Myles, M. D.
1901 to 1906
Wendell C. Phillips, M. D.
1907 to 1916
Thomas J. Harris, M. D.
1917 to date
William H. Haskin, M. D.

1901 to 1907
Ewing W. Day, M. D.
1908 Chevalier Jackson, M. D.
1909 to date
Ewing W. Day, M. D.

COUNCIL.

1896—T. P. Berens, M. D.
J. H. Billings, M. D.
D. L. Hubbard, M. D.
H. H. Curtis, M. D.
W. C. Phillips, M. D.
R. C. Myles, M. D.
1897—G. H. Makuen, M. D.
T. P. Berens, M. D.
W. C. Phillips, M. D.
H. H. Curtis, M. D.
E. W. Day, M. D.
D. L. Hubbard, M. D.
1898—J. E. Nichols, M. D.
H. H. Curtis, M. D.
L. A. Coffin, M. D.
W. C. Phillips, M. D.
E. W. Day, M. D.
C. W. Richardson, M. D.
S. E. Solly, M. D.
1899—W. H. Daly, M. D.
W. C. Phillips, M. D.
T. H. Halsted, M. D.
J. O. Roe, M. D.
H. W. Loeb, M. D.
T. C. Christy, M. D.
F. L. Jack, M. D.
D. L. Hubbard, M. D.
1900—S. E. Solly, M. D.
W. H. Daly, M. D.
A. W. Calhoun, M. D.
J. B. Clemens, M. D.
J. F. McKernon, M. D.
W. C. Phillips, M. D.
J. E. Sheppard, M. D.
J. Price Brown, M. D.
Max Thorner, M. D.
1901—D. B. Kyle, M. D.
S. MacCuen Smith, M. D.
S. E. Solly, M. D.
J. Price Brown, M. D.
W. H. Daly, M. D.
J. B. Clemens, M. D.
J. F. McKernon, M. D.
C. W. Richardson, M. D.
F. C. Cobb, M. D.
1902—D. B. Kyle, M. D.
S. E. Solly, M. D.
J. F. McKernon, M. D.
S. MacCuen Smith, M. D.
F. C. Cobb, M. D.
N. H. Pierce, M. D.
T. P. Berens, M. D.
J. A. White, M. D.
1903—C. W. Richardson, M. D.
R. C. Myles, M. D.
D. B. Kyle, M. D.
J. F. McKernon, M. D.
S. MacCuen Smith, M. D.
F. C. Cobb, M. D.
N. H. Pierce, M. D.
T. P. Berens, M. D.
C. R. Holmes, M. D.
1904—J. A. Stucky, M. D.
C. W. Richardson, M. D.
R. C. Myles, M. D.
A. G. Root, M. D.
T. P. Berens, M. D.
C. R. Holmes, M. D.
E. B. Dench, M. D.
F. L. Jack, M. D.
J. E. Schadle, M. D.
F. R. Packard, M. D.
1905—N. H. Pierce, M. D.
J. A. Stucky, M. D.
C. W. Richardson, M. D.
L. A. Coffin, M. D.
T. H. Halsted, M. D.
C. R. Holmes, M. D.

E. B. Dench, M. D.
F. L. Jack, M. D.
J. E. Schadle, M. D.
F. R. Packard, M. D.

1906—F. C. Cobb, M. D.
N. H. Pierce, M. D.
J. A. Stucky, M. D.
E. B. Dench, M. D.
F. L. Jack, M. D.
F. R. Packard, M. D.
L. A. Coffin, M. D.
T. H. Halsted, M. D.
J. F. McKernon, M. D.
H. W. Loeb, M. D.

1907—J. E. Logan, M. D.
F. C. Cobb, M. D.
N. H. Pierce, M. D.
L. A. Coffin, M. D.
T. H. Halsted, M. D.
J. F. McKernon, M. D.
H. W. Loeb, M. D.
C. W. Richardson, M. D.
D. B. Kyle, M. D.

1908—W. C. Phillips, M. D.
J. E. Logan, M. D.
F. C. Cobb, M. D.
J. F. McKernon, M. D.
H. W. Loeb, M. D.
C. W. Richardson, M. D.
D. B. Kyle, M. D.
C. R. Holmes, M. D.
J. M. McCaw, M. D.

1909—J. E. Logan, M. D.
D. B. Kyle, M. D.
C. W. Richardson, M. D.
W. C. Phillips, M. D.
J. M. McCaw, M. D.
W. R. Lincoln, M. D.
G. L. Richards, M. D.
J. F. Barnhill, M. D.
G. H. Makuen, M. D.

1910—C. R. Holmes, M. D.
G. L. Richards, M. D.
J. F. Barnhill, M. D.
G. H. Makuen, M. D.
N. H. Pierce, M. D.
W. C. Phillips, M. D.
F. R. Packard, M. D.
A. B. Duel, M. D.
Robert Levy, M. D.

1911—J. F. McKernon, M. D.
J. A. White, M. D.
N. L. Wilson, M. D.
C. R. Holmes, M. D.
A. B. Duel, M. D.
F. R. Packard, M. D.
Robert Levy, M. D.
G. L. Richards, M. D.
N. H. Pierce, M. D.

1912—C. R. Holmes, M. D.
F. R. Packard, M. D.
N. H. Pierce, M. D.
J. F. McKernon, M. D.
J. A. White, M. D.
N. L. Wilson, M. D.
C. Jackson, M. D.
M. A. Goldstein, M. D.
A. B. Duel, M. D.

1913—James F. McKernon, M. D.
Joseph A. White, M. D.
Norton L. Wilson, M. D.
Chevalier Jackson, M. D.
Max A. Goldstein, M. D.
Arthur B. Duel, M. D.
Harris P. Mosher, M. D.
E. Fletcher Ingals, M. D.
G. Hudson-Makuen, M. D.

1914—Chevalier Jackson, M. D.
Max A. Goldstein, M. D.
Arthur B. Duel, M. D.
Harris P. Mosher, M. D.
E. Fletcher Ingals, M. D.
G. Hudson-Makuen, M. D.
H. Holbrook Curtis, M. D.
John E. Sheppard, M. D.
Robert Levy, M. D.

1915—Joseph A. White, M. D.
Harris P. Mosher, M. D.
E. Fletcher Ingals, M. D.
G. Hudson-Makuen, M. D.
H. Holbrook Curtis, M. D.
John E. Sheppard, M. D.
Robert Milligan, M. D.
John M. Ingersoll, M. D.
B. R. Shurley, M. D.

1916—G. Hudson-Makuen, M. D.
H. Holbrook Curtis, M. D.
John E. Sheppard, M. D.
Robert Milligan, M. D.
John M. Ingersoll, M. D.

B. R. Shurley, M. D.
E. B. Dench, M. D.
D. J. Gibb Wishart, M. D.
Robert Levy, M. D.

1917—Robert Milligan, M. D.
John M. Ingersoll, M. D.
E. B. Dench, M. D.
D. J. Gibb Wishart, M. D.
B. R. Shurley, M. D.
Robert Levy, M. D.
S. MacCuen Smith, M. D.
Thomas H. Halsted, M. D.
Walter A. Wells, M. D.

1918—D. J. Gibb Wishart, M. D.
B. R. Shurley, M. D.
Robert Levy, M. D.
S. MacCuen Smith, M. D.
Thomas H. Halsted, M. D.
Walter A. Wells, M. D.
T. J. Harris, M. D.
Francis P. Emerson, M. D.
L. W. Dean, M. D.

1919—S. MacCuen Smith, M. D.
Thomas H. Halsted, M. D.
Walter A. Wells, M. D.
Thomas J. Harris, M. D.
Francis P. Emerson, M. D.
L. W. Dean, M. D.
Frank R. Spencer, M. D.
Joseph C. Beck, M. D.
Wendell C. Phillips, M. D.

1920—Class A
Thomas J. Harris, M. D.
Lee Wallace Dean, M. D.
Francis P. Emerson, M. D.
Class B
George L. Richards, M. D.
Joseph C. Beck, M. D.
Frank R. Spencer, M. D.
Wendell C. Phillips, M. D.
Class C
Herbert S. Birkett, M. D.
LaFayette Page, M. D.
Robert C. Lynch, M. D.

1921—Class A
George L. Richards, M. D.
George E. Shambaugh, M. D.
Frank R. Spencer, M. D.
Wendell C. Phillips, M. D.
Class B
Herbert S. Birkett, M. D.
LaFayette Page, M. D.
Robert C. Lynch, M. D.
Class C
Harris P. Mosher, M. D.
Joseph F. McCaw, M. D.
Dunbar Roy, M. D.

1922—Class A
Herbert S. Birkett, M. D.
LaFayette Page, M. D.
Robert C. Lynch, M. D.
Class B
Harris P. Mosher, M. D.
Joseph F. McCaw, M. D.
Dunbar Roy, M. D.
Class C
Lee Wallace Dean, M. D.
James F. McKernon, M. D.
Norval H. Pierce, M. D.

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Friedenberg, Edward, M. D.....1903
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Gradle, Henry, M. D.....1911

Koyle, F. H., M. D.....1911
Dudley, William F., M. D.....1912
Kimball, Irving E., M. D.....1913
Gildea, Patrick F., M. D.....1913
Adams, J. L., M. D.....1914
Gibb, Jos. S., M. D.....1914
Gruening, Emil, M. D.....1914
Sheppard, John E.....1916
Roe, John O.....1916
Ballenger, Wm. L.....1916
Dye, Hobart S.....1917
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Solenberger, Amos R.....1917
Daley, Walter S.....1918
Ingals, E. Fletcher.....1918
Yates, D. G.....1918
Chappell, Walter F.....1919
Ray, James Morrison.....1919
Bird, N. S.....1919
Blake, Clarence J.....1919
Holmes, E. M.....1919
Holmes, Christian R.....1920
Horn, Henry W.....1920
Lutz, Stephen Henry.....1920
Kenefick, Joseph Aloysius.....1920
Friedberg, S. A.....1920
Curtis, H. Holbrook.....1920
Cort, Geo. F.....1921
Linhart, C. P. 1921
Kyle, J. J.....1921

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Whistler, W. McNeil.....1899
Gougenheim, Achille.....1901
Gruber, Joseph.....1901
Brown, Lennox.....1902
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Joal, Joseph.....
Woakes, Edward.....
Semon, Sir Felix.....1921

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